

REPORT  
OF THE  
MINISTER OF AGRICULTURE  
FOR THE  
DOMINION OF CANADA  
FOR THE YEAR ENDED MARCH 31  
1917

*PRINTED BY ORDER OF PARLIAMENT.*



OTTAWA  
J. DE LABROQUERIE TACHÉ  
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY  
1917



REPORT

MINISTER OF AGRICULTURE

DOMINION OF CANADA

IN THE YEAR 1917

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# REPORT

OF THE

## MINISTER OF AGRICULTURE

### 1916-17.

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*To His Excellency the Duke of Devonshire, K.G., P.C., G.C.M.G., G.C.V.O., etc., etc.,  
Governor General and Commander in Chief of the Dominion of Canada.*

MAY IT PLEASE YOUR EXCELLENCY:

I have the honour to submit to Your Excellency a report of the Department of Agriculture for the fiscal year ended March 31, 1917.

#### I. GENERAL REMARKS.

Under the respective headings of the branches and divisions of this department will be found a synopsis of proceedings during the past year. The work in each branch has been efficiently carried on.

There has been no legislation affecting the department during this period.

By an Order in Council of date the 28th day of August, 1916, the general regulations under "The Destructive Insect and Pest Act", approved under date the 4th November, 1914, and amendments thereto, were further amended by striking out regulation IV and substituting therefor the following:—

IV. *An Inspector shall have power to enter any lands, nursery, or other premises where there is reason to believe that any of the insects, pests or diseases hereinafter specified are or may be present, or where there exists trees, shrubs, or other vegetation which prevents the successful control of the said insects, pests or diseases. An Inspector shall give such instructions as may be necessary for the treatment or destruction of any tree, bush, crop or other vegetation or vegetable matter or the containers thereof, which may be found or suspected to be infected with, or constitute an obstacle to the successful control of any of the insects, pests or diseases hereinafter specified, and such instructions shall be carried out by the owner or lessee of the infected, suspected, or*



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*menacing* vegetation, vegetable matter or containers thereof and such remedial treatment shall be carried out and continued until the insect, pest or disease shall be deemed by the Inspector to have been exterminated *or the menace removed. The Inspector shall have power to carry out the required treatment or destruction if necessary.*

*Vide Canada Gazette, vol. L, p. 723.*

I have to report with regret the death, on the 23rd June, of Dr. C. C. James, C.M.G., Commissioner under the Agricultural Instruction Act. Devoted to agriculture, he was indefatigable in his service, and by his broad knowledge and tireless energy he contributed in an unusual degree to the betterment of the conditions of this great Canadian industry.

Mr. W. J. Black, B.S.A., late Secretary of the Economic and Development Commission, was appointed to succeed the late Dr. James, on the 19th July, 1916.

Canada participated in the Panama-California International Exposition held in San Diego, California, during 1916 and also up to the 31st of March last. The exhibit was considered one of the main features of the exposition, and attracted a great deal of attention.

As there are no big international exhibitions in sight, it has been decided to pack up the Canadian exhibits and ship them to Ottawa.

A report from the Canadian Exhibition Commissioner for the fiscal year ended March 31, 1917, will be found as an appendix hereto. (See appendix No. 2.)

## II. ARTS AND AGRICULTURE.

### DAIRY AND COLD STORAGE BRANCH.

The year under review was a very profitable one for the dairying industry of Canada. There was a large increase in the production of milk, and consequently in the output of butter, cheese, and condensed milk. A glance at the figures of our export trade in dairy produce will show a very gratifying increase in the quantity shipped abroad, and a much larger increase in value, due to the high prices that have prevailed.

In the fiscal year ended March 31, 1914, the quantity of butter exported was 1,228,753 pounds valued at \$309,046, while during the past year the quantity exported was 7,990,453 pounds valued at \$2,491,992.

In 1914 the quantity of cheese exported was 144,478,340 pounds valued at \$18,868,785, whereas this year the quantity was 180,733,426 pounds valued at \$36,721,136.

In 1914 the quantity of condensed milk exported was 9,339,382 pounds, worth \$666,941. This year the quantity was 15,858,622 pounds, and the value, \$1,371,610.

Taking the aggregate value of butter, cheese, condensed milk, fresh cream, and casein exported from Canada during the past year, it amounts to the fine total of \$41,367,705, a sum which is \$10,000,000 in excess of any previous year. If to this



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we add the value of the milk, butter, and cheese consumed at home, a reasonable estimate of which would be \$140,000,000, we arrive at a total production of \$181,367,705.

The foregoing figures present in unmistakable form a convincing illustration of the argument that the best spur to increased production is found in high prices.

## A DISASTER TO THE CHEESE INDUSTRY AVERTED.

In the beginning of the season of 1916 the very existence of the cheese industry was seriously threatened by a shortage of rennet, the agent which has been used from the earliest times to coagulate the milk as the first step in the process of manufacturing cheese. Rennet is prepared from calves' stomachs, the supply of which has been obtained during the last thirty years principally from Bavaria, Hungary, and Russia. Supplies from these countries being entirely cut off by the war, it was obvious that, unless a substitute could be found, the cheese factories would have to cease operations as soon as the stock on hand was exhausted, or until such time as farmers and butchers could be induced to save a sufficient number of the stomachs of calves slaughtered in this country. The efforts made to secure calves' stomachs in Canada were not very successful, and it soon became evident that something else must be depended on.

## A SUBSTITUTE FOR RENNET.

It had been known for some years that a pharmacopœial preparation known as "pepsin," prepared from the stomachs of pigs, had coagulating properties similar to rennet, but it had never been used in the commercial manufacture of cheese.

Experiments were at once undertaken at the Finch Dairy Station, in which various chemicals and different preparations of pepsin were tried, and by careful tests it was demonstrated that pepsin could be safely employed as a substitute for rennet, and that cheese made in this way were equal in quality to those made with rennet. The matter was taken up with the manufacturing chemists, and the result was that in a few weeks, standard preparations, suitable for cheesemaking, were put on the market, which are now being used very extensively in the place of rennet.

## UNSUITABLE PREPARATIONS OFFERED.

The prospects for a new business in supplying rennet substitutes attracted considerable attention, and several preparations were offered to the cheesemakers which were quite unsuitable for the purpose. Many chemicals will coagulate milk, but more is required than mere coagulation. There is a somewhat obscure fermentation or digestive process set up by rennet and pepsin which seems to control the ripening, or curing, of the cheese. The cheesemaker is not in a position to determine, without making a practical test, whether any alleged coagulant is suitable for the purpose or not, and as a large quantity of milk is handled daily in a cheese factory, and it is weeks before it can be determined whether the coagulant is serving the purpose or not, it is evident that the risk involved is very great.



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The Dairy Commissioner advised the cheesemakers not to purchase any preparation which had not been thoroughly tried by some competent person who could recommend it. The results of the tests of inferior articles were published as soon as known. In this way the reputation of Canadian cheese was protected, and heavy losses averted. There was also the danger of uninformed persons attributing any defect in the quality of the cheese to the use of pepsin, and thus injuring the reputation of the Canadian product. Any alleged defects in cheese due to pepsin which were reported were followed up by the experts of the department, and in every case it was found that the defect was due to something else, or to the fact that the pepsin was not properly used. By thus proving the satisfactory character of pepsin, confidence was established in a very short time.

#### PEPSIN SUPPLIED BY THE DEPARTMENT AT COST.

As a precaution against an actual shortage, I authorized the Dairy Commissioner to purchase a quantity of pepsin to be sold to cheesemakers at cost in cases of failure on their part to secure supplies through the regular trade channels, or in the event of any attempt being made to unduly inflate the price of pepsin. The result is that cheesemakers can now secure pepsin in both liquid and powdered form at a price, which, although higher than the pre-war price of rennet extract, is only about one-third the present cost of standard rennet extract.

It was thought at first that there was a slightly larger loss of fat in the whey when pepsin only was used, but further investigations and experience in the use of pepsin show that quite as good results in this respect can be obtained with pepsin as with rennet. With this last objection removed, there is no reason why cheesemakers should pay high prices for rennet.

#### THE DAIRY STATION AT FINCH, ONT.

The dairy station at Finch, Ont., was under operation by the department as a model cheese factory and creamery the entire year, as usual, the business increasing slightly over that of the previous year. The total quantity of milk received in 1916 was 2,486,380 pounds and the average value to the patrons was \$1.60 per 100 pounds, compared with 2,418,010 pounds of milk received in 1915 and an average value of \$1.35 per 100 pounds.

#### THE CREAMERY AT ST. HILAIRE, N.B.

The Madawaska creamery at St. Hilaire, N.B., was operated by the department during the summer months of 1916, and there was a considerable increase in the quantity of butter made in comparison with the previous season. Farmers in the district are well pleased with the results obtained, and a further increase is looked for in the quantity of milk furnished to this creamery during the coming season of 1917.

The average price paid to the patrons in 1916 was 35.55 cents per pound of butter fat. In 1915 the average price paid was 27.09 cents per pound.



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## COW TESTING.

During the season of 1916 the general plan of cow testing was continued as in former years:—

(a) Through "Cow Testing Associations," in which the testing of milk samples from individual cows was done entirely by managers of cheese factories and creameries, for which they were paid by the department at the rate of 5 cents per test. (Under this plan there were 572 herds with 4,457 cows tested in 1916.)

(b) Through "Dairy Record Centres," in which an officer of the department had direct charge of the milk testing.

The following table shows the steady growth of the work at the thirty-five dairy record centres in the last three years, without increasing the number of men employed:—

	Total Number of Herds.	Total Number of Cows Under Test.	Total Number of Records Received.
1914... .. .	2,027	17,777	126,527
1915... .. .	2,743	23,009	183,560
1916... .. .	3,383	29,409	212,854

The above figures do not include the large number of individual farmers who are making tests privately as a result of the cow-testing propaganda, and who are supplied with forms without charge by the Dairy and Cold Storage Branch.

The steadily increasing number of applications for milk and food record forms, particularly the forms for daily weights of each milking, that continue to come from all corners of the Dominion, testify to the widespread desire for the information to be derived from cow testing. There are also a great many inquiries from farmers for information about milk-testing apparatus.

Statistics show that there has been an average increase in milk production of over 1,000 pounds per cow for the whole of Canada since this work was started. At present values, this increase represents about \$40,000,000.

## INSPECTION OF DAIRY PRODUCTS.

The inspection of dairy products has been carried on during the past year in the same manner and by the same staff as during the previous year. The methods of inspection are described in detail in Appendix IX of the Report of the Dairy and Cold Storage Commissioner for the fiscal year ending March 31, 1915.

## ADULTERATION OF BUTTER.

Preliminary tests for water-content were made of 2,040 samples of creamery, dairy, and whey butter, of which 114 samples ( $5\frac{1}{2}$  per cent of the number tested) contained more than the legal maximum of 16 per cent of water, and were therefore adulterated.

This does not mean, however, that  $5\frac{1}{2}$  per cent of all butter sold is adulterated, as usually only butter which appears to be high in water-content is sampled for testing. In most cases, when the water-content of butter is in excess of the legal maximum, it is evident that such excess is not due to any intent to defraud, but is rather due to ignorance of the principles controlling the incorporation of water in butter, or



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to carelessness in the application of same. If circumstances indicate that there is no definite intent to defraud, the offender, for a first violation, is usually let off with a warning.

During the year, six prosecutions were made on account of excess water, a conviction being secured and a fine imposed in each case.

#### IMITATIONS OF BUTTER.

During the year two convictions have been secured for the sale of butter imitations, and a fine of \$200, together with the costs of prosecution, was imposed in each case.

#### WEIGHTS OF PRINTS OR BLOCKS OF BUTTER.

The weights of prints or blocks of butter throughout the country continue to improve. During the past year, eighteen cases of short-weight prints have been prosecuted, and convictions secured. The fines imposed ranged from \$10 to \$50, with costs. The number of convictions on account of short-weight prints is fifteen more than during the previous year. This is due to a more vigorous policy in connection with this part of the work. Short weight is the greatest form of fraud in connection with the butter trade at the present time. With butter retailing at the present high price of about three cents per ounce, the question of short weight becomes very important.

#### BRANDING OF CREAMERY BUTTER.

During the past year two prosecutions have been taken, and convictions secured, on account of creamery butter being branded in such a manner as to give false information as to the creamery in which the butter was made.

#### REFRIGERATOR CAR SERVICES FOR BUTTER AND CHEESE.

The special refrigerator car service for butter was in operation from May 8 to October 7. About 1,300 cars were operated in this service, at a cost to the Department of about seven thousand dollars. By reason of a guarantee of earnings from my department, a regular refrigerator service was provided for the dairy sections of the country, and shippers were able to forward any quantity of butter, from one package upwards, without any expense other than the regular less-than-carload freight rate. During the period referred to, two inspectors were employed at Montreal, one at Toronto, and one at Halifax to report the condition of the butter cars on arrival, the temperature of the butter, quantity of ice remaining in the bunkers, etc. These reports were received daily at Ottawa, and anything of an adverse character was promptly transmitted to the railway company concerned.

From June 12 to September 9, about 1,300 carloads of cheese were moved by refrigerator cars to Montreal and Quebec for export, and on these shipments the department paid the icing charge of \$5 per car. This was in accordance with the agreement between my department and the railway companies, which provides for a refrigerator car service for carload shipments of cheese between the dates mentioned.



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## CARGO INSPECTION.

Four cargo inspectors were employed at Montreal during the season of navigation, instead of six as in pre-war days, and one inspector at Halifax. In Great Britain the usual staff of four inspectors was maintained, covering the ports of London, Liverpool, Glasgow, and Bristol. Under existing conditions the class of labour employed in loading and unloading the ships was naturally not so expert as before the war, and the proportion of breakage was therefore considerably increased. The inspectors did the best they could to supervise the handling and to keep down the percentage of breakage to a minimum. Thermographs were placed in the regular liners, and temperature records were obtained for the information of the shippers. Full reports were also made on the condition of all perishable cargo loaded or discharged at any of the ports mentioned above.

## THE GRIMSBY PRECOOLING AND EXPERIMENTAL FRUIT STORAGE WAREHOUSE.

During the season of 1916 the experimental cold storage warehouse at Grimsby, Ont., which is owned and managed by this department, under the direction of the Dairy and Cold Storage Commissioner, carried on experiments and demonstrations on:—

The proper maturity of fruit for long-distance shipment.

Best style of package.

Methods of loading cars.

The use of brine tank cars for fruit shipments.

The rate of precooling at different temperatures, and in different styles of packages.

Bulletins covering the experiments have been issued and are available for distribution.

During the season this warehouse handled 1,567,328 pounds of fruit for the local growers. This quantity is equivalent to about eighty carloads.

## PUBLIC COLD STORAGE WAREHOUSES.

Under the provisions of the Cold Storage Act (chapter 6, 6-7 Edward VII) the sum of \$26,053.21 was paid in the form of subsidies to public cold storage warehouses that had been erected in conformity with the above Act. No new contracts were entered into during the year, and the expenditure under this head is decreasing rapidly each year.

## CREAMERY COLD STORAGE.

A bonus of \$100 is paid to any creamery that builds a suitable cold-storage room according to plans and specifications furnished free by the department. During the year, forty-one applications for this bonus were received and thirty were approved and paid. In the case of the other eleven the conditions laid down by the department were not complied with. This bonus system was commenced in 1897, and since that time 977 creameries have taken advantage of it.



## PUBLICATIONS.

During the year the following publications have been issued:—

Bulletin 49.—Small Cold Storages and Dairy Buildings.

Bulletin 50.—The Use of Brine Tank Refrigerator Cars for Fruit Shipment.

Bulletin 51.—The Rate of Precooling Fruit in Different Styles of Packages and at Different Temperatures.

Bulletin 52.—Methods of Handling Basket Fruits.

Circular 18.—The Use of Pepsin as Substitute or Partial Substitute for Rennet in the Manufacture of Cheese.

Circular 19.—Directions for Using Soluble Powdered Pepsin as a Substitute for Rennet.

Circular 20.—Cow Testing:

Circular 21.—Further Notes on the Use of Pepsin and Other Substitutes for Rennet in the Manufacture of Cheese.

## THE SEED COMMISSIONER'S BRANCH.

The work of the Seed Commissioner's Branch during the past year has been under four main divisions—seed growing, seed testing, seed inspection, and seed supply. The question of seed supply has required more attention than usual.

The production and use of better seed is encouraged by subventions to the provinces for field-crop competitions, seed fairs and provincial seed exhibitions, and to growers of field root and vegetable seeds under certain conditions. A grant is also made to the Canadian Seed Growers' Association, which directs the production of registered and improved seeds grown from superior stocks.

Seeds are tested for purity and germination at the Ottawa and Calgary laboratories. Twenty-five samples are tested free of charge for any company or individual. For each additional test a charge of 25 cents is made. This work has increased greatly during the last few years.

The seed trade is regulated under the Seed Control Act. Inspectors are assigned to definite districts to visit seed dealers and growers, report the kinds and quantity of seeds offered for sale, and forward samples from inferior lots for official analysis. The Seed Control Act defines the quality of different grades of timothy, red clover, alsike, and alfalfa seeds. Special seed grades are also defined by Order in Council for Western Canada grain, and seed corn on the cob is sold under the voluntary control agreement. Those seeds for which grades are not defined must be labelled with the names of all noxious weed seeds which are present in excess of a stated proportion. All seeds not up to vitality standards for good seed of the kind must be sold under mark of actual percentage germination. Violations of the Act are punishable by fines.

Information is collected and compiled on seed supplies for farm and garden crops. Where a shortage occurs, special efforts are made to stimulate production and facilitate securing and distributing available supplies. Timothy seed growing is being encouraged in Alberta, and field root and vegetable seeds where conditions are favourable. This year seed grain in large quantities has been purchased and distributed at cost.

The following summary report gives in more detail the nature of the work carried on by this branch.



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## SEED GROWING.

## FIELD CROP COMPETITIONS AND SEED FAIRS.

These services are conducted by the provinces, with the assistance of Dominion subventions amounting to two-thirds of the moneys awarded in cash prizes, but not exceeding approximately one-half the total cost of conducting this educational work. The number of competitions held continues to increase. During the summer of 1916 there were 442 field-crop competitions conducted, on which subvention amounting to \$25,785.57 was claimed, as follows:—

Prince Edward Island.. . . .	\$ 686 99
Nova Scotia... . .	796 27
New Brunswick... . .	781 00
Quebec... . .	4,000 00
Ontario... . .	13,013 33
Manitoba... . .	46 65
Saskatchewan... . .	2,612 31
Alberta... . .	2,849 32
British Columbia... . .	1,000 00

This number of competitions held shows an increase of twenty-five over the previous season. The total subvention claimed is about \$60 less than in 1915. The falling-off was principally in Nova Scotia, Manitoba, and British Columbia. Substantial increases are shown by New Brunswick, Quebec, Saskatchewan, and Alberta.

In the winter and early spring of 1915-16 there were 177 local seed fairs on which subvention was paid amounting to \$7,083.69, divided as follows:—

Prince Edward Island.. . . .	\$ 200 00
Nova Scotia... . .	240 32
New Brunswick... . .	300 00
Quebec... . .	1,934 51
Ontario... . .	113 53
Manitoba... . .	1,225 10
Saskatchewan... . .	1,767 00
Alberta... . .	1,303 23

These returns show an increase of thirty-two in the total number of seed fairs held in comparison with the previous season, and an increase of nearly \$1,000 in the subvention paid.

Provincial seed exhibitions were conducted during the winter of 1915-16, and subventions paid as follows:—

Prince Edward Island.. . . .	\$446 00
Nova Scotia... . .	187 00
Maritime Provinces Winter... . .	595 00
Fair, Amherst, N.S... . .	.....
New Brunswick... . .	419 00
Quebec... . .	450 00
Ontario, Guelph... . .	550 67
Ottawa... . .	582 67
Manitoba... . .	600 00
Saskatchewan... . .	300 67
Alberta... . .	400 00
Total .. . . .	\$4,531 01

The returns for the seed fairs and provincial seed exhibitions conducted during the present year are not completed.



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## FIELD ROOT AND VEGETABLE SEEDS.

The production of field-root and garden vegetable seeds has been further encouraged during the past year. For the supervision of this work the employment of special officers became necessary. Supplies of these seeds from Europe have been materially reduced and have advanced in values. Seedsmen, accordingly, have offered contracts and stock seed to Canadian growers for 1917 and 1918 production at quite remunerative prices. My officers in direct charge of this work have been able to arrange for the production of a substantial part of our requirements of these seeds by assisting seedsmen in placing orders for their supplies with experienced growers in the provinces of British Columbia and Ontario. The acreage of swede turnip and the hardier vegetable seeds is also being extended in Quebec and the Maritime Provinces. It is anticipated that by thus placing the industry on a sound business basis, profitable to both the grower and the trade, greatly increased production will result.

The quantity of homegrown seeds produced in 1916 remained practically as in 1915. The seed on which subvention was paid amounted to over 27,400 pounds, the subvention being approximately \$1,200. The kinds and amounts produced were: sugar beet, 20,325 pounds; mangel, 2,283; swede, 1,948; parsnip, 1,209; onion, 1,066; garden beet, 250; and smaller quantities of table carrot, cabbage, tomato, and radish. A large number of farmers and gardeners also grew sufficient seed for their own use.

## REGISTERED AND IMPROVED SEED.

Financial support to the work of the Canadian Seed Growers' Association has been continued. This association is now receiving \$7,000 per year from the Seed Commissioner's Branch appropriation. Valuable work is being done by members of this association in the production of superior strains of seed, particularly cereals. Under the direction of the association, individual growers or farming clubs are provided with select seed, usually developed by an Experimental Farm, which is grown under rules to maintain its purity. The product of this select stock seed is catalogued each year by the association as registered or improved seed, according to its standing, and constitutes a valuable source of supply for high class seed.

## SEED TESTING.

Under this general division of the work is included the testing of seeds for farmers and merchants, identification of samples, and general educational and investigation work in connection with the cleaning and handling of seeds. Many samples of seed are also tested in connection with the seed inspection system.

## SEED TESTED FOR FARMERS AND MERCHANTS.

Severe injury to the principal grain crops from different causes throughout Western and much of Eastern Canada last fall resulted in a great increase in the volume of work demanded of the seed laboratories at Ottawa and Calgary. The Calgary laboratory has been enlarged and improved, and has been able to render an immense



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service to the grain growers of Western Canada by giving them exact information in regard to the purity and vitality of grain which they were contemplating using as seed.

From September 1, 1916, to March 31, 1917, 11,870 samples of grain and other seeds were received and tested at Calgary, as compared with 6,882 for the same period last year. In reporting on samples sent by farmers, the results of the germination tests have been accompanied by remarks as to the impurities and recommendations for improving the seed by cleaning.

At the Ottawa laboratory, 9,763 samples were received from September 1 to March 31. The larger proportion of these were received from wholesale and retail merchants, and represent lots of timothy, red clover, alsike and alfalfa intended for sale throughout the trade under grades as required by the Seed Control Act.

An unusually large number of red clover seed samples were received from Ontario farmers, due no doubt to the excellent conditions for seed production obtaining the previous fall. The seed was of an unusually high quality, but too much of the Ontario seed is polluted with the seeds of ribgrass, ragweed, night-flowering catchfly, foxtail and other weeds whose seeds are of such a size that they are difficult or impossible of separation by sieves in ordinary cleaning machinery. Accompanying the ordinary purity reports issued to farmers on red clover samples, letters and circulars have been sent giving information in respect to cleaning and handling the seed.

## EDUCATIONAL WORK.

The influence of the seed laboratory in spreading information in regard to the value and meaning of seed testing has been enlarged through the work of district representatives of the provincial Departments of Agriculture and others who conduct short courses in agriculture for farmers and farmers' sons. These courses usually include work on seed testing, seed judging, weed-seed identification and related subjects. The seed laboratory has supplied those responsible for the conduct of these classes with weed seeds, grain, screens and suggested outlines of work that might be taken up in connection therewith. Similar assistance has also been given to those taking up agriculture subjects in collegiate institutes, high schools and continuation classes.

A good deal of attention has also been given to the question of cleaning grain and other seeds by means of the ordinary fanning mill. One of the chief reasons why such poor results are accomplished by fanning mills is that many of the sieves that were originally supplied have been lost or worn out. An improvement in this connection is expected, as the co-operation of the manufacturers of fanning mills has been enlisted and they are now prepared to supply sieving to cover old frames to fit the farmers' mills.

Our efforts towards bringing about more careful and thorough cleaning of western grain at threshing time are being continued, and we have evidence that improvement has been made in many sections. Considerable interest has been aroused among the grain growers and live-stock men, and reports of successful experiments in cleaning grain at threshing time have been received. The manufacturers of threshing machines have been acquainted with the problem and at least one firm has set about per-



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feeting an appliance for attachment to the threshing machine to separate the screenings. Live stock and other associations have been given information in regard to the feeding and handling of screenings. It is of interest to note that the screenings accumulating at the Canadian Government elevators are being utilized as recommended in the department's bulletin on "Grain Screenings."

It has been found necessary to limit somewhat the distribution of our reference collections of one hundred kinds of weed and economic seeds.

The identification of seeds of weeds and other plants has received careful attention, necessitating much correspondence.

The laboratories are co-operating with the Association of Official Seed Analysts of North America in its efforts to improve the methods of germination and purity analysis. Mr. E. D. Eddy, Chief Seed Inspector, was president of the association last season and attended the annual meeting in St. Paul in July: Mr. J. R. Dymond, Acting Chief Seed Analyst, has been referee on purity analysis for the association for two years, and attended an executive meeting of the Association held in New York in December, 1916, in affiliation with the American Association for the Advancement of Science.

#### SEED INSPECTION.

Inspection under the Seed Control Act has been continued along the usual lines. Owing to the light crop of clover seed in Ontario in the fall of 1915, a larger proportion than usual of the seed on the market the next spring was imported. Most of this seed was of excellent quality in respect to purity, and was properly graded when offered for sale. The 1916 crop of clover seed was much better than that of the previous season, and a larger proportion of the seed being sold this spring is Canadian grown. Some of the finest clover seed, both red and alsike, on the market this year was produced in New Ontario.

As has been the case for a number of years, very little clover and timothy seed is being put on the market by large dealers that is not in conformity with the Seed Control Act requirements. Most of the violations are on the part of farmers or local dealers in the seed-producing districts who do not have their seed thoroughly cleaned, tested, and properly graded. One of the principle difficulties with which local dealers and farmers have to contend is that a great deal of the seed when threshed is badly contaminated with weed seeds, and cannot be properly prepared for market except by the use of power cleaners, which are now operated only by the large dealers.

In the spring of 1916 the seed being offered for sale was inspected in 2,203 places, a decrease of sixty-five compared with the previous season. The larger places were visited by the inspectors several times. For this work temporary seed inspectors are employed to assist the regular district officers of the Seed Branch. Apart from vegetable seeds, 615 violations of the Act were detected in the spring of 1916, a decrease of about fifty compared with the previous year. Of these, 205 were for not having timothy, red clover, alsike, or alfalfa marked with the grade number; forty-eight were for having these seeds wrongly graded; and 175 for offering seeds which were below the standard for No. 3. There were 144 violations for exposing cereals and other seeds for which grades are not provided, without being labelled to indicate the presence



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of noxious weed seeds, and forty-three for seeds being below the germination requirements. Most of the violations were for first offences or of a minor character, and it was considered necessary to institute legal proceedings against only thirteen dealers. One of the seedsmen whose samples were collected in connection with the paper-packet seed investigation was included in this number.

## PAPER PACKET SEEDS.

The paper packet seed investigation commenced in the spring of 1915 has been continued and some valuable results secured. The work of the second year has confirmed the results during the first season, in that it shows a great difference respecting the vitality and quantity of seed supplied in paper packets by various dealers. For the purpose of the investigation, sample packets of twenty standard varieties of vegetable seeds put up by ten of the largest dealers were collected by seed inspectors. The difference in the vitality of seeds supplied by various dealers is shown by the range in the proportion of their samples germinating below two-thirds of the standard for good seed which was from 8 to 53 per cent. The quantity of vital seed supplied also varied greatly with the different dealers, and in some cases with different packets put out by the same firm. Results so far indicate that certain dealers are supplying seed very low in vitality and also decidedly inferior in respect to uniformity and type character. The investigation is being continued, with more attention being given to type and the quality of the crop produced.

## SEED CORN CONTROL.

The Seed Corn Control agreement which was inaugurated in the spring of 1916 has been renewed with some slight modifications. Under this agreement, producers of Canadian-grown corn undertake to sell seed corn on the cob only under certain regulations, which require that the corn shall be properly named as to variety and marked grade No 1 or No. 2 according to defined standards. All corn sold under the agreement is subject to sampling by seed inspectors or the purchaser, and if it is found to be wrongly graded certain penalties are attached. An alphabetical list of the growers offering seed corn under the agreement renewed were received from ensilage growers, who consider it a valuable protection against being supplied with inferior seed, and also from the seed-corn growers.

Owing to the extremely unfavourable weather conditions which prevailed during the season of 1916, the amount of corn produced in Canada which was suitable for seed was very limited, probably not more than 10 per cent of the normal supply. The small quantity available was exhausted early in the season, and most of the growers who would otherwise be offering seed this spring under the control system of marketing now have none for sale. These conditions have greatly reduced the number of growers under the agreement and the amount of seed offered this season.

## THE SEED SUPPLY.

## SEED GRAIN GRADES.

The special grades for seed grain inspected at the Canadian Government elevators, referred to in last year's report, was revised in October on my recommendation to the



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Governor in Council. Standards were defined for No. 1 Canada Western seed oats, No. 1 Northern and No. 2 seed wheat, and No. 3 Canada Western seed barley. These grades are based on the commercial grade standards with further requirements in respect to purity, dockage, and vitality. For the seed grades, Red Fife and Marquis wheat are kept separate. All grain on which ex-elevator seed certificates are issued must be cleaned to the dockage set by the seed inspectors and be free from noxious weed seeds within the meaning of the Seed Control Act. The application of these special seed grades is effected through the co-operation of my colleague, the Honourable the Minister of Trade and Commerce, whose officers are responsible for handling the grain in the elevators, apart from the inspection for the seed grades. The inspection of the seed when it enters the elevators, and when cleaned for shipment, is done by my staff of seed inspectors.

#### SEED PURCHASING COMMISSION.

Owing to the extremely unfavourable weather conditions prevailing in parts of Canada last season, the grain crop was greatly reduced in yield and the quality much impaired. Early in the fall it became evident that prompt action was desirable, on the part of the Government, in order to preserve the best part of the western crop and make it available for seed this spring.

With this in view the Governor in Council, on my recommendation, appointed a special seed-purchasing commission with authority to purchase, and store in the Canadian Government elevators, grain that was suitable for seed. This grain was to be cleaned to the seed-grade standards, under the inspection of Seed Branch officers, and delivered, on order of the chief commissioner, at a price sufficient to cover the average cost of the grain plus charges for cleaning, sacks, loading ex-elevator, and other necessary expenses. The cost of the commission, including salaries, is being met from the Seed Branch appropriation. For the personnel of the commission, appointments were made from the most experienced inspectors of the Seed Branch staff. Mr. A. E. Wilson, Indian Head, Sask., is chief commissioner and purchasing agent.

The duties of the Seed Purchasing Commission included negotiations with provincial and municipal governing bodies in the three prairie provinces with a view to securing their co-operation in the matter of providing seed to grain growers who were really in need of financial support. The provinces of Manitoba and Saskatchewan promptly adopted suitable legislation authorizing their municipal governing bodies to extend credit to those farmers who were in need. With these arrangements completed, and in view of the fact that shortage of seed supply in the province of Alberta was confined to a few relatively small localities which were taken care of by local interests, apart from special legislation, the seed purchasing commission were able throughout to maintain a basis for selling seed grain subject to payment by bank draft on arrival of the seed.

The Seed Purchasing Commission, acting for Western Canada, and the Canadian Government Elevators Seed Department, with officers at 226 Grain Exchange, Winnipeg, acting as selling agent for the commission for Eastern Canada, were able to fill all orders for seed grain from municipal governing bodies, farmers' organizations, farmers, and also wholesale and retail seed merchants in all parts of Canada, that were received, with grain of superior quality that was clean and suitable for seeding.



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The sum of \$400,000 was first made available for the purchase of seed wheat, according to the terms of the Order in Council (P.C. 2314) October 7, 1916. A further sum of \$800,000 was provided by Order in Council (P.C. 3073) December 14, for the purchase of seed oats and barley as well as wheat. On March 23 a final appropriation of \$500,000 was made by Order in Council, (P.C. 830), making a total of \$1,700,000 made available for the purchase of seed grain. The money was placed at the credit of the Seed Purchasing Commission at the Bank of Montreal, Regina, Sask., in installments of \$100,000 as required. The total amount issued to the credit of the commission at Regina was \$1,400,000. All seed sold by the commission was for cash, and all proceeds from sales of seed grain were deposited to the credit of the Receiver General. It is expected that all the money advanced to the commission for purchases will be returned from sales before the end of June, with the probability of a small surplus.

Up to March 31 the commission had purchased 629,383 bushels of wheat, 392,815 bushels of oats, and 1,566 bushels of barley. The average cost of the wheat at the elevators was approximately \$1.84 per bushel, No. 1 Northern basis; and the oats, approximately 59 cents per bushel. In the cost price is included the premium over the commercial grade price paid for seed grain and the inward freight to the elevators.

The quantity sold and delivered by the commission up to April 7 amounted to 398,063 bushels of cleaned seed wheat, at an average price of approximately \$1.98 per bushel, No. 1 Northern basis, and 7,480 bushels of oats at an average price of approximately 69½ cents per bushel. These prices include freight paid to point of shipment, and sacks and sacking for a part of the grain. These oat sales do not include the sale made through the Winnipeg office of the Canadian Government Elevators where orders were accepted from Eastern Canada for No. 1 Canada Western cleaned seed oats which were sold at 80 cents per bushel, freight paid to Fort William.

## WESTERN CANADA TIMOTHY SEED.

For several years officers of this branch have devoted considerable attention to the production of timothy seed in Western Canada, particularly certain districts in Alberta. It has been found that the seed produced in the Prairie Provinces is usually of excellent quality. In 1912 a propaganda was instituted to stimulate timothy seed production in the principal live-stock districts of Alberta. By 1915 the industry had developed sufficiently to supply the needs of the province, and nine car loads of Alberta timothy seed were shipped to points outside the province.

An inquiry last August indicated a large increase in the timothy seed harvest with considerable anxiety on the part of farmers as to facilities for assembling and cleaning the seed for market. The matter was submitted by the Seed Commissioner to the Board of Grain Commissioners, resulting in an arrangement becoming effective September 1 for handling the seed at the Canadian Government terminal elevator at Calgary, on the general basis that is applied to flax seed and cereal grains. Announcement was made to growers and dealers that timothy seed would be received at the Calgary elevator, cleaned, graded, warehouse receipt issued for the net weight of recleaned seed, stored for fifteen days, and finally sacked and loaded on the cars



ex-elevator at a total charge of 5 cents per hundredweight. It was recognized that this was merely a nominal charge, as the process of cleaning timothy seed is much slower than with flax seed or cereal grains.

During the past season, 1,337,460 pounds of timothy seed were received at the Calgary elevator. Of this amount about 86 per cent was graded No. 2 under the Seed Control Act standards, 12½ per cent No. 3, and only 1½ per cent was below the No. 3 standard. The Alberta seed has found a ready market.

THE LIVE STOCK BRANCH.

I took the opportunity last year of pointing out, through my report, the very great importance of live-stock production as an increasing commercial asset to the country and, at the same time, called attention to the advantages of stimulating and developing our export trade in establishing a permanent and lucrative market for our surplus live-stock products. During the year which has just closed, the significant truth of the statements then made has been more clearly and impressively emphasized through the growing urgency of the food problem which has confronted the United Kingdom and her allies. Throughout the twelve months, prices of eggs, poultry, bacon, and beef have risen to an unprecedented level, a fact which serves to indicate very faithfully the well-recognized world shortage of meats and meat products. That the farmers of Canada are contributing a substantial quota to the Empire's need in this regard is made clear by a consideration of the amounts of our exports of such staple commodities as are included in the following statement. Comparison with the exports of previous years indicates the remarkable resources of the country in the ability to respond to a market demand which has been called into being in such a limited interval of time.

EXPORTS.

	Fiscal Year.				
	1913.	1914.	1915.	1916.	1917.
	\$	\$	\$	\$	\$
Eggs. ....	58,176	92,322	1,206,518	2,705,416	1,810,380
Poultry.....	279 276	211,763	551,078	440,319	388,035
Bacon.....	5,351,225	3,763,330	11,812,186	25,759,266	43,011,439
Beef.....	160,877	1,165,295	2,060,430	6,154,632	5,750,435
Ham.....	322,669	270,049	2,654,064	1,382,734	766,595
Pork.....	79,687	216,810	2,610,776	2,054,316	2,522,926
Wool.....	314,588	803,522	2,786,665	1,506,579	2,595,488
Totals.....	6,566,498	6,523,091	23,681,717	40,003,262	56,845,298

NOTE.—The figures for 1913-14-15-16 include importations re-exported. For 1917, the figures are for domestic exports only.

I am glad to be able to say that the services of the Live Stock Branch have been utilized to the very fullest possible extent in developing the movement and in strengthening the position of the country in this direction. Under the circumstances, I feel



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that there is ample justification for the increasing appropriations which Parliament has been asked to provide for this work. The activities which have been undertaken during the past year have undoubtedly aided greatly in extending production, in increasing the facilities in marketing, and in developing a strong, confident attitude throughout the country which, even under the difficulties presented through shortage of labour and high prices for feed, has stimulated an extension of effort and of enterprise in all the provinces of the Dominion. I am particularly glad to be able to comment upon the willingness of such powerful institutions as the banks, the railways, and the distributors to co-operate with the department in what has been undertaken. The need for the commercial expansion of our live-stock industry upon a sound business basis is being widely recognized, and I am satisfied that even more significant developments are yet to be expected.

Following is a brief enumeration of the activities of the Live Stock Branch during the past year:—

## HORSE DIVISION.

## DISTRIBUTION OF PURE-BRED STALLIONS.

During the year the work of loaning stallions was continued. The original intention of the policy to loan stallions in the outlying and newly settled districts is being closely adhered to. Stallions have been supplied to many new associations in outlying districts which otherwise would be forced to use scrubs, as the people are unable to purchase pure-bred animals for themselves. The branch has purchased, since the inception of the policy in 1913, some 158 horses. These have been distributed from Cape Breton Island to the new districts of British Columbia and up in the Peace River country. To date only eight of these stallions have died. Considering the varying conditions under which these horses are kept, it is really a remarkable showing. As a whole, these horses have been particularly healthy, and have left a high percentage of good, serviceable colts. Many letters and reports have been received during the year from various sections of the country telling of the great improvement that has been brought about by the strong prepotent blood of the pure-bred. Many associations sent in renewal applications, although the stallions had been with them three or even four years.

In addition to improvement in the horse stock, the value of sticking to one breed and the advantage of co-operation among the breeders is slowly but surely taking root. Districts that formerly had the loan of stallions from this branch have this year reorganized their associations into clubs for the purpose of hiring horses. In several cases, at least, clubs would not have been formed had it not been for the fact that the value of co-operation among the breeders and the advantages of using a good stallion had already been demonstrated.

## FEDERAL ASSISTANCE TO HORSE BREEDING.

This policy of allowing a district to organize a club for the purpose of hiring a good stallion for the use of the members is proving particularly popular. The reports show that the clubs are hiring the best stallions to be found in the country.



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This will have a two-fold influence upon horse breeding. The generous patronage given to good horses will result in having a larger number of high-class colts than heretofore. Moreover, the fact that the clubs are hiring the best horses will result in the importers bringing a better class of stallion into the country, while our own breeders will be encouraged to use not only the best stallions, but to procure the best mares in their efforts to raise the high-quality class of horses required. This policy has received the favourable commendation of experienced breeders throughout the country. Time and again letters have been received stating that it is undoubtedly the best policy at present in operation in any horse-breeding country of the world. From the number of applications already received there will undoubtedly be five or six times as many clubs in operation during the season of 1917 than there were in 1916. From the inquiries for good stallions throughout the country, it would appear that the farmers are again giving serious attention to horse breeding.

During the year, in addition to the several thousand horses purchased for war purposes, some 12,000 were shipped from eastern points to the western farms. Saskatchewan dealers also bought largely in Manitoba and in Alberta. Unlike other classes of live stock, the prices of horses have not been enhanced by war conditions. However, everything considered, the average price has been fairly good. Reports go to show that some sections of the country have sold rather short. Particularly is this true in the case of good, young mares. Farmers to-day would be wise not only to retain their good, young mares, but to breed them to the best stallions within reach. Horses are not a class of live stock that a farmer can go out of to-day and step into to-morrow. If the best results are to be obtained and a constant steady supply kept up, their breeding must be given steady, persistent attention.

CATTLE DIVISION.

DISTRIBUTION OF PURE-BRED BULLS.

In 1913 the policy of loaning pure-bred bulls to associations specially organized under rules laid down by the Live Stock Branch was inaugurated. Each season the number of applications has been very large, and the filling of same has practically absorbed the annual supply of suitable bulls. On December 31, 1916, the number of bulls in the hands of associations was as follows:—

Breed.	British Columbia.	Alberta.	Saskatchewan.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.
Shorthorn.....	19	181	256	69	69	126	2	11	21	754
Ayrshire .....	10	1	3	.....	5	189	12	25	9	254
Holstein .....	13	5	18	8	13	42	2	3	2	106
Hereford.....	.....	15	13	9	2	3	.....	.....	.....	42
A. Angus .....	1	7	6	6	1	.....	.....	.....	.....	21
Canadian.. ..	.....	.....	.....	.....	.....	23	.....	.....	.....	23
Jersey .....	6	.....	.....	.....	.....	1	1	2	.....	10
Guernsey.....	1	.....	.....	.....	.....	.....	.....	2	.....	3
R. Polled.. ..	1	.....	1	1	.....	.....	.....	.....	.....	3
	51	209	297	93	90	384	17	43	32	1,216



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These sires are loaned for only one year at a time, and an association is required to meet the cost of maintaining an animal as long as it remains in its hands. The department reserves the right to inspect the animals at any time and withdraw assistance in the event of it being found that an association is not living up to its agreement. An association may renew its application for the loan of the same animal at the expiration of its term, and, if all the requirements have been complied with, such applications are promptly approved. When necessary the sires are exchanged, but only for animals of the same breed. All bulls are inspected at least once a year by regular officers of the Live Stock Branch. By their advice and recommendations our inspectors are able to do much towards promoting the objects of the associations, and, in addition, it has been found that the bulls are kept in much more satisfactory condition when inspections are made regularly. Usually one inspection a year is made, but when it is found necessary two and even three visits are made.

The reports received indicate that in the majority of cases the sires placed have resulted in a marked improvement in the quality of the live stock of the districts affected. Such improvements usually result in increased interest in cattle raising, and in many cases districts assisted two or three years ago have now so increased their holdings of cattle that the members have purchased bulls of their own and no longer require assistance from the branch. An effort is being made to encourage the members of the associations to feed their young stock properly so that an advantage obtained by superior blood will not be lost through unintelligent handling.

## CAR-LOT POLICY.

To effect a more equal distribution of our live-stock population, the granting of assistance through the Live Stock Branch to farmers wishing to secure good breeding stock has been authorized. Under this policy the department pays reasonable travelling expenses of the representative of individuals or associations from any section of Canada desiring to purchase one or more carloads of breeding stock in any part of the country, the expenses allowed to cover railway transportation and living expenses from the home of the purchaser to the point at which it is expected that the purchase will be made, also hotel expenses and livery expenses for the time which should be sufficient to purchase the consignment. No assistance in the payment of freight is rendered, nor is any responsibility assumed by the branch in connection with the purchase price of the consignment. Further, no assistance under the policy is rendered if stock is purchased for speculative purposes. This policy has been quite widely taken advantage of during the past two or three years.

In the fall of 1916 the policy was extended to admit of the payment of the expenses of farmers purchasing stockers and feeders at the stockyards in Western Canada. This action was deemed advisable in view of the need of maintaining in the country, if possible, the stocker and feeder cattle which would otherwise go across the line as in previous years. The results obtained are summarized in a concise form in the following table:—



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STATEMENT of the Shipments of Feeding and Breeding Cattle from Union Stock Yards, St. Boniface, Manitoba, October, 1916, to March, 1917, when the "Car Lot Policy" was in force; also a Statement showing Shipments during a similar period twelve months previous.

	West Shipments.		United States Shipments.		Totals.	Totals.
	1915-16.	1916-17.	1915-16.	1916-17.	1915-16.	1916-17.
October.....	810	6,017	9,709	5,511	10,519	11,528
November.....	1,962	7,240	5,464	2,455	7,426	9,695
December.....	1,590	3,942	882	866	2,472	4,808
January....	225	1,076	51	241	276	1,317
February.....	687	1,665	25	247	712	1,912
March.....	1,187	2,338	167	225	1,354	2,563
Totals.....	6,461	22,278	16,298	9,545	22,759	31,823

Comparing the periods, October to March, 1915-16, and October to March, 1916-17, if the same proportion had gone south last season as in the previous season, almost 23,000 unfinished and breeding cattle would have left the Dominion, while the actual figures show but 9,545. Taking the matter in another way, there were 22,278 head shipped to points in the country, as compared with 6,641 in the previous period—a conservation to the country of nearly 16,000 head. In addition, there were about 3,600 breeding and feeding cattle returned to the country under the "Car-lot Policy," from the Calgary and Edmonton markets.

RECORD OF PERFORMANCE.

The year 1916-17 has been a very hard one for most owners of dairy cows. Large numbers of cows, which, under ordinary conditions, would have been milked all winter, were allowed to go dry in the fall owing to the scarcity of grain, roots and silage.

It was not encouraging at any time after the spring of 1916 for a man to enter his cows for any kind of test for production. Notwithstanding these adverse conditions, the interest in the record of performance test shows no signs of abatement, and owners who have had to drop out of the test for awhile, in nearly all cases express their intention of commencing again as soon as feed conditions are better. A number of applications for entry of cows in the test have been received from beginners with small herds.

The number of herds in the western provinces from which cows are entered for test, is increasing steadily. The average production of the cows under test, and the percentage qualifying for a certificate is gradually increasing.

The inspectors on this work not only test the cows entered for the record of performance, but large numbers of others. In many cases there may be only a few of a herd under test, but the owner likes to know what the rest are producing. Very often neighbours bring samples of their cow's milk to be tested. Where milk or cream is being shipped, the inspector is often requested to test it. The work is appreciated, and is promoting the improvement of dairy stock and is leading to the adoption of better methods in its care.



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The following is a brief summary of the work for the year:—

Number of cows entered in the test—	
Ayrshires...	656
French-Canadians..	44
Guernseys...	27
Holstein-Friesians..	628
Jerseys...	192
Shorthorns...	137
Total..	1,684
Number of cows qualified—	
Ayrshires...	223
French-Canadians..	14
Guernseys...	8
Holstein-Friesians..	221
Jerseys...	64
Shorthorns...	50
Total..	580
Number of bulls qualified—	
Ayrshires...	8
French-Canadians..	1
Holstein-Friesians..	8
Jerseys...	1
Total..	18

APPENDIX.

The records tabulated in the appendix are for cows which have produced sufficient milk and fat to qualify, but which have failed to freshen within fifteen months after the commencement of test.

Ayrshires...	28
French-Canadians..	1
Holstein-Friesians..	41
Jerseys...	9
Shorthorns...	13
Total..	92

SHEEP AND GOAT DIVISION.

Sheep raising is assuming a role of great importance in live-stock production in Canada. The supply of wool and mutton products throughout the world are by no means sufficient to meet requirements. This is especially true of wool, which represents a necessity in the prosecution of the war for the manufacture of soldiers' clothing. Canadian farmers are manfully trying to cope with these conditions of scarcity, and are entering upon sheep raising with the determination to conserve and increase the country's flocks and raise the standard to a degree which will bring recognition to Canada as a premier sheep-producing country.

*Assistance to Co-operative Associations in Preparing Wool for Market.*—However, the sheep industry in the past by no means occupied the prominent position in Canadian agriculture which its importance demands. Realizing this, I instructed the officers of the Live Stock Branch in 1913 to undertake a study of the character of Canadian wool and sheep and determine what steps should be taken to effect an improvement in their status. Results of the investigations showed clearly that the



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principal objections with wool obtained chiefly with condition. The quality of the scoured product for those grades produced here was most satisfactory. The fault lay with the preparation of the wool.

Under the conditions existing, Canadian woollen manufacturers were able to purchase their wool to better advantage on outside markets, owing to their being able to secure a uniform and dependable quality and a much cleaner product. A further objection to domestic wool was that it was neither classified nor graded.

In connection with the efforts of the department in conducting a propaganda for more and better wool, wool growers' associations were organized, and an appeal was made to the sheep-raiser to introduce modern methods of preparing the wool for market. Wool prepared by members of these associations was then classified by expert wool graders, supplied free of charge to the associations by the Live Stock Branch. As a result of this work, which has now been in progress for three years, wool is eagerly sought after by dealer and manufacturer, and commands a price greatly in advance of what breeders were able to obtain when following the old unsystematic methods.

Wool growers' associations are now organized in every province of the Dominion. In order to convey some idea of the manner in which the co-operative sales of wool are appreciated by the wool growers, the following review has been prepared of the progress of the work since its inception. In 1914, 206,129 pounds of wool were graded for societies organized in four provinces—namely, Quebec, Ontario, Manitoba, and Alberta. In 1915 the number of organizations formed for this purpose was increased to nineteen. Approximately 420,000 pounds were classified and offered for co-operative sale. In 1916 this amount had reached the total of 1,721,598 pounds, with a value of \$579,678.69, and every province was represented.

Wools east of Port Arthur last year brought an average of 41.01 cents per pound, while wool west of that point brought an average of 31.53 cents. The difference in price per pound may be explained by the greater shrinkage in the wools of Western Canada, and the closer proximity of eastern domestic wools to the woollen markets of this country. It is worthy of note that over \$500,000 has been received by the sheep-raisers of Canada during the present year through the medium of the co-operative wool sales.

Observations made with regard to the advantages to be obtained by the wool grower through the sale of wool in a graded condition reveal the fact that, in many instances, where wool disposed of through co-operative associations brought 36 cents per pound, a similar grade or quality of wool, grown in the same vicinity, marketed in a haphazard fashion, returned the producer only 28 cents per pound.

Another step forward in the co-operative movement, in connection with the sale of wool, has been the introduction of lamb sales. In the fall of 1916 the Antigonish, N.S., Sheep-raisers' Association disposed of over 2,000 head of lambs by co-operative sale. It is expected sales of this character will assume greater proportions next year.



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The following tabular statement shows clearly the advance which has been made in co-operative wool sales in Canada since the inception of this policy:—

Name of Association.	Amount of Wool. 1914.	Amount of Wool. 1915.	Amount of Wool. 1916.
	lb.	lb.	lb.
Prince Edward Island—			
Prince Edward Island Wool Growers' Assn.....		5,496 $\frac{1}{4}$	23,176 $\frac{1}{4}$
Nova Scotia—			
Antigonish Wool Growers' Assn.....		12,271	17,322
Guysboro Wool Growers' Assn.....			1,119 $\frac{1}{2}$
New Brunswick—			
Moncton & Westmorland Wool Growers' Assn.....			1,873
Sussex & Studholm Wool Growers' Assn.....		1,103 $\frac{3}{4}$	3,257
Quebec—			
Argenteuil Wool Growers' Assn.....		6,372	10,608 $\frac{1}{2}$
Beauharnois Wool Growers' Assn.....		8,601	13,607
Bedford Wool Growers' Assn.....		6,702	16,521 $\frac{1}{2}$
Compton Wool Growers' Assn.....		12,849	24,404 $\frac{1}{2}$
Megantic Wool Growers' Assn.....			3,998 $\frac{3}{4}$
Pontiac Wool Growers' Assn.....	12,000	43,657	52,590 $\frac{1}{2}$
Richmond Wool Growers' Assn.....		10,030	16,923 $\frac{3}{4}$
Sherbrooke Wool Growers' Assn.....		6,045	16,088 $\frac{1}{2}$
Stanstead Wool Growers' Assn.....		9,936	13,958
Ontario—			
Manitoulin Island Wool Growers' Assn.....	15,742	20,295	17,989
Manitoba—			
Elkhorn Wool Growers' Assn.....		10,648	9,220
Manitoba Sheep Breeders' Assn.....	44,059	64,777	141,719
Saskatchewan—			
Saskatchewan Wool Growers' Assn.....			178,000
Alberta—			
Alberta Sheep Breeders' Assn. (Calgary).....	95,137	105,883	385,675
Alberta Provincial Sheep Breeders' Assn. (Edmonton).....		12,788	52,270
† Carstairs Wool Growers' Assn.....	11,039 $\frac{1}{2}$		
‡ Central Alberta Wool Growers' Assn.....	18,216		
Lacombe Wool Growers' Assn.....	9,935	24,141	35,979
Pincher District Wool Growers' Assn.....		35,916	20,246
Southern Alberta Wool Growers' Assn.....			503 944
Cardston District Wool Growers' Assn.....			106,455
Vermilion Wool Growers' Assn.....		29,642	33,901
British Columbia—			
Vancouver Island Flock Masters' Assn.....			15,751
Total .....	206,128 $\frac{1}{2}$	427,153	1,721,593 $\frac{1}{4}$

† United with Alberta Sheep Breeders' Association 1915.

‡ United with Lacombe Wool Growers' Association 1915.

*Wool Warehouse.*—Difficulties in disposing satisfactorily of the western wool, owing to the great distance from the consuming market, which is in the eastern provinces, made it appear advisable to establish a central warehouse in proximity to the woollen mills, where the wool may be shipped and stored until such time as would seem expedient for its sale. This will be located in Toronto, and will be in operation during 1917. The wool, as received from the associations graded by officials of the Live Stock Branch in the field, will be held for sale by the department, acting as custodian for the growers and subject to their order. Arrangements with the banks will permit the growers to receive from them a monetary advance upon grading statements and bills of lading after the wool is sealed in the cars at shipping point.



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This undertaking was decided upon following a conference with western wool growers' associations, and as a result of an investigation of the situation by officers of the department. The market for Canadian wool is in the east, where practically all the woollen mills are located. There are no mills using wool in the grease in Western Canada. Largely owing to this fact, western growers have been unable in the past, even though the wool in the last three years has been carefully graded and assembled in bulk at several important shipping centres, to secure satisfactory competitive bids. Permanent storage capacity being unavailable, the growers have been obliged to accept whatever bids could be obtained and, consequently, have always been at a disadvantage in marketing their product.

*Prizes for Fleece Wool at Fairs.*—Prizes for wool in the fleece represent an innovation established, at the instance of the department through the medium of the Live Stock Branch, by many Canadian fairs during the year. A greater number of fleeces were entered in most instances than it was expected the first year would bring forth, and the interest the exhibits aroused upon display augurs well for a substantial increase in the number of entries in this class next year. Secretaries of fairs offering prizes were satisfied with the showing this department made, so much so that not only is a continuance assured, but other exhibitions have proposed introducing a similar classification in their prize lists.

Most of the eastern fairs had the prizes divided into three sections: fine, medium, and coarse, but two exhibitions included lustre as well, which makes the classification very complete, covering all types of domestic wool produced to any degree. In the Prairie Provinces four classes were provided, two for range or merino, fine and medium, and two for domestic, medium and coarse. Four, five, and in some instances as many as seven awards were given. Sheep-raisers alone were permitted to compete, manufacturers and dealers being excluded.

*Wool Exhibit.*—Greater interest attended the presentation of the wool exhibit than in any previous year. Consequently, its itinerary was extended and it was displayed at a greater number of fairs. It has already this year been shown at thirty-one fairs, from Vancouver to Halifax, and was visited by more than a million people. During that time, 84,900 copies of pamphlets upon the sheep and wool husbandry were distributed to people distinctly interested in the pursuit of this phase of the live stock industry.

Many new features this year were added to the exhibit. A very complete display of Karakule wool and Persian lamb-skins produced in Canada acted as an educational attraction, together with sheep-skins, pulled wool, slats, and their manufactured articles. Products of the home woollen industries of Canada were exhibited in an effort not only to introduce them to the consuming public, but to create a more widely spread interest in the development of work of this character by women in the home. Demonstrations, showing the most approved methods of preparing wool for market, and in grading and sorting, were given at every fair. At the Canadian National Exhibition, Toronto, a special educational feature was staged, in connection with the display of home-spun woollen fabrics, showing the process of manufacture from wool to yarn and cloth as spun and woven by hand.



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*Sheep Breeders' Directory.*—A directory has been prepared of breeders of sheep in the different provinces. This comprises both pure-bred and commercial animals, and contains data of the class or grade of sheep, together with the number raised or for sale by each breeder. This information is for public distribution, and the plan is proving most useful in conserving breeding stock by serving to get prospective breeders more closely in touch with those who have animals of this character for sale. Under previously existing conditions, sheep suitable for breeding purposes were all too liable to find their way to the shambles.

*Distribution of Pure-bred Rams and Boars.*—The policy of loaning pure-bred sires to farmers' associations has now been in operation four years. Assistance of this nature is confined to districts where the farmers have difficulty in securing well-bred sires, or are in financial circumstances which restrict their ability to purchase the most suitable type of breeding male. In pursuing this work, it has been the purpose of the branch to limit an association to a single breed and advise persistent use of the original selection. Adherence to this system by societies has already shown results of the greatest benefit in fostering not only a keen desire amongst members to produce a better class of live stock but in creating, as well, a uniform type within a district. Live-stock breeding in Canada has never conformed to any distinctive standard. The farmer would in many instances, switch from one type to another radically different, without assuring himself whether the change would be advantageous or not. Not infrequently this caused undoubted injury and produced a haphazard in breeding which was not wholesome. An advance toward the establishment of the community system of breeding which obtains so satisfactorily in Great Britain, is a direct result of this policy of the branch.

As the following tabulated statement shows, fifteen hundred and twenty-three rams, and four hundred and sixteen boars of all the most prominent breeds have been distributed.

## RAMS LOANED TO ASSOCIATIONS OF FARMERS. (Corrected to January 1, 1917.)

Breed.	Prince Edward Island.	Nova Scotia.	New Brun- swick.	Quebec.	Ontario	Mani- toba.	Saskat- chewan.	Alberta.	British Colum- bia.	Total.
Shropshire .....	86	100	23	229	30	9	5	82	1	555
Oxford Down....	32	214	12	86	8	27	2	51	1	433
Leicester.....	15	8	14	262	54	3	3	.....	.....	359
Cheviot.....	5	4	3	16	.....	.....	.....	.....	.....	28
Southdown....	9	16	1	12	2	.....	.....	.....	4	44
Hampshire .....	.....	.....	7	61	.....	.....	.....	.....	.....	68
Lincoln.....	.....	.....	3	14	.....	.....	.....	.....	.....	17
Suffolk.....	.....	.....	.....	.....	.....	6	.....	.....	.....	6
Cotswold.....	.....	.....	.....	1	2	.....	.....	.....	.....	3
Total.....	147	342	63	681	96	45	10	133	6	1,523



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BOARS Loaned to Associations of Farmers. (Corrected to January 1, 1917.)

Breed.	Prince Edward Island.	Nova Scotia.	New Brunsw- wick.	Quebec.	Ontario.	Mani- toba.	Saskat- chewan.	Alberta.	British Colum- bia.	Total.
Yorkshire.	2	10	4	107	16	7	24	20	3	193
Berkshire. ....	6	1	1	4	16	16	33	44	8	129
Poland China....					1		9	4	2	16
Duroc Jersey....						1	7	17	3	28
Chester White....		6	1	32	3					42
Tamworth....				4		2	1	1		8
Total. ....	8	17	6	147	36	26	74	86	16	416

POULTRY DIVISION.

Under the impetus given by the increasing export demand, the poultry industry of the Dominion has taken on new life. In no way is this more apparent than in the interest expressed by the individual farmer. Heretofore, poultry have not been seriously considered on many farms. During the past year, however, conditions have been such as to emphasize the importance and profitableness of poultry-keeping. The price of eggs has been unprecedented. Starting at a comparatively low level last April, it showed a steady increase through the summer, fall, and winter months. A considerable quantity of eggs went out for export in the month of June and early July, and so heavy was the movement during the fall and early winter months that the Canadian markets were practically bare of Canadian eggs during January, February, and early March.

The very wet spring interfered with hatching to quite an extent and, as a result, the lateness of the pullets, combined with the particularly severe winter, mitigated against a maximum production of winter eggs, so much so that a considerable quantity of imported eggs was required to supply the consumptive demand.

The scarcity of feed has also affected the poultry industry, and many individuals who had not been accustomed to secure winter eggs rather seriously depleted their flocks last fall. Despite this fact, the high price of eggs last winter, when, in some instances, producers received as high as 78 cents or 80 cents a dozen, awakened such an interest that this spring there has been more attention paid to pure-bred poultry, more chickens hatched, and a greater endeavour made by producers everywhere to place the poultry business upon a practical paying basis.

The Live Stock Branch, through its Poultry Division, has kept in close touch with the market situation throughout the year. Every encouragement and assistance has been given to co-operative marketing, with exceptionally good results. The inter-provincial movement of eggs has been encouraged and fostered, and efforts made to raise the standard and bring about that uniformity in quality which will serve as the best advertisement for the Canadian product in the export trade following the war.

In this connection, extended publicity has been given to the matter of uniform standards for eggs. Classes for eggs graded in accordance with these standards have been encouraged at all of the larger exhibitions with very creditable entries at many points. These standards are being adopted by the trade and used in connection with



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the interprovincial movement of eggs. The egg exhibits and candling demonstrations at fairs have been continued. In all, 156 exhibits were made during the year, with an attendance of some 243,400 people. The candling demonstrations given in connection with these exhibits proved to be quite popular, it being estimated that some 98,000 people took advantage of the instruction given in the art of candling and grading eggs. Of those availing themselves of the demonstration, over 75,000 made application for candling appliances, which have been duly forwarded to them.

## EGGS.

Canadian eggs continue to find favour on the British market, as is apparent chiefly from the enhanced price of from 2 cents to 5 cents a dozen which the Canadian product has commanded in comparison with that of the United States. The markets of Great Britain have taken all the Canadian surplus, amounting to between seven and eight million dozens. Their requirements were much greater than this, as is evidenced by the large quantities of United States eggs passing through Canada in bond, most of which have been re-packed for shipment in this country. The regulations recommended to and applied by the Customs Department with respect to the branding of the packages of all foreign eggs passing through Canada for export, has effectively overcome much of the misrepresentation previously occurring with respect to the sale of foreign eggs as Canadian. Indications are not lacking, however, that more stringent regulations are required with respect to the grading and labelling of our own domestic product, in order to adequately safeguard the interests of our future export trade.

## THE CO-OPERATIVE MARKETING OF EGGS AND POULTRY.

The high prices prevailing for eggs and the keenness of competition for a quality product has given, during the past year, a strong impetus to co-operative organization. The older associations with an established connection have been unusually successful. The newer associations organized have also benefited materially from the increasing demand for Egg Circle eggs.

In all, last year some three-quarters of a million dollars' worth of eggs and poultry were marketed co-operatively throughout the Dominion. Of this, the Prince Edward Island Co-operative Association contributed a quarter of a million and the egg Circles in Ontario over a hundred thousand dollars' worth.

In addition to the organization of new units, the efforts of the department have been directed towards perfecting the older associations in a co-operative way. This is particularly true in Prince Edward Island and in some parts of Ontario, the Prince Edward Island Association having been described as perhaps having no equal in America with respect to its equity, finance, and truly co-operative spirit. This association is particularly strong financially, and has not only acquired its own property in Charlottetown but has added greatly to its warehouse accommodation.

In the newer fields, the work in the province of Alberta is showing special promise at the present time. During the winter a great many meetings were held, and the co-operative system of marketing fully explained. This spring a central receiving



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station has been opened in Calgary, and the prospects are that another will be required in Edmonton at an early date. Increasing interest in this connection has also been shown among producers in both Saskatchewan and Manitoba.

#### THE EGG AND POULTRY MARKETS' REPORT.

In connection with the Markets Intelligence Service organized under the Live Stock Branch, special attention has been given to the matter of the egg and poultry situation. During the past year the sources of market information have been gradually improved and a tentative report issued weekly to a limited mailing list of the officers of the branch, and certain others especially interested. I am now arranging to give this report wider distribution in connection with the Markets Intelligence Service of this department, and already have had many very appreciative letters regarding same and the steps being taken to place the market situation fully and frankly before the people.

#### FEDERAL ASSISTANCE TO FAIR ASSOCIATIONS.

The establishment of the policy of increased grants to fair associations, which was commenced in 1915, proved so satisfactory that it was continued during the year 1916. Needless to say, all the associations which had benefited by this grant in the year 1915 applied for further assistance during the past year. The many letters received from secretaries and other officers of these associations proved that this policy was adopted by the department just at the correct time, and that without it many of the medium-sized and even some of the larger fairs would have had to suspend operations. The basis under which the grants were given was practically the same as in the previous year.

To fair associations which paid out at their 1915 exhibition for prizes in the utility classes of horses, cattle, sheep, swine, and poultry a sum of \$5,000 or over, a grant was made equal to half the amount actually paid out, the maximum grant in any case not to exceed \$5,000. The prize lists of these exhibitions were first submitted to the Live Stock Commissioner for his approval before being printed, and in this way many suggestions which later proved to be very useful were made. During the year 1916, twenty-eight fairs were given grants by the department, this entailing an expenditure of \$109,375.72.

#### THE MARKETS INTELLIGENCE SERVICE.

Recognizing the need of information which would be of assistance to the producer in marketing his live stock in a more intelligent manner, the Intelligence Service was organized for the purpose of gathering detailed information regarding current live-stock prices, and the supply and demand for Canadian live stock and live-stock products. As the public live-stock markets are the centres where supply and demand are best indicated and where an index to the general live-stock conditions can best be secured, representatives were placed at all the large central live-stock markets in Canada. In addition to keeping in touch with the trend of the markets, the representatives have secured details as to prices; the different kinds of live stock have been



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classified according to quality; the district in each province from which they came has been ascertained and the disposition of the stock procured. Arrangements are being made that the branch may be always in close contact with the source of production, in order that the future condition of the market may be correctly interpreted. The co-operation of the farm press has been secured in connection with the distribution, weekly, of this information and it is expected that a very efficient system in this direction will be perfected. The dissemination of this market data among all interested in the sale of live stock and live-stock products will give stability to the trade, tend to better uniformity of prices, consequent on a more regular supply, and further will create greater confidence in the future of our live stock industry.

## DOMINION EXPERIMENTAL FARMS AND STATIONS.

The work of the Experimental Farms Branch has been actively pursued during the year. In addition to the experimental work carried on at the Central and Branch Farms, all possible attention has been given to the problems connected with maximum production of crops during the war.

The flax investigation work has been continued. Acre lots of fibre were grown in various sections of the Dominion. These have been gathered at the Central Farm, where a flax building has been erected and is now ready for the installation of machinery. The flax will be retted and scutched, and it will then be possible to form some opinion as to its quality as compared with flax grown in Ireland and other parts of Europe. Arrangements have been made for growing further experimental areas of flax during the coming season.

Plant pathological laboratories have been erected at Brandon, Man., and Indian Head, Sask. It is expected that the chief work at these will be the study of diseases affecting cereal crops.

Preparatory work, such as clearing and draining, were continued at the new Stations at Kapuskasing, Ont., and Spirit Lake, Que., and a large area on each is ready for crop this coming season.

Lack of buildings has delayed the work, especially with live stock, on some of the newer Stations.

During the year the following publications have been issued or are now in the press:—

The Annual Report of the Experimental Farms for 1915-16.

## In the Regular Series of Bulletins—

- No. 87. The Principles of Poultry House Construction, by F. C. Elford, Dominion Poultry Husbandman.
- No. 88. The Preparation of Poultry Produce for Market, by the same author.
- No. 89. Poultry Keeping in Town and Country, by the same author.

## In the Second Series—

- No. 27. Soil Fertility, by Dr. F. T. Shutt, Dominion Chemist.
- No. 28. Flax for Fibre, by John Adams, Assistant Dominion Botanist.
- No. 29. Cranberry Culture, by M. B. Davis, Assistant in Horticulture.
- No. 30. Feeding for Beef in Alberta, by W. H. Fairfield and G. H. Hutton.
- No. 31. Gopher Destruction, compiled by J. H. Grisdale.

## In Pamphlets—

- No. 14. The Home Vegetable Garden, by W. T. Macoun, Dominion Horticulturist.



In Circulars—

- No. 12. The Black or Stem Rust of Wheat, by H. T. Gussow, Dominion Botanist.
- No. 13. Garden Making on Vacant Lots, by W. T. Macoun, Dominion Horticulturist.

Special Circulars—

- No. 1. Grain Growing on the Prairies, by J. H. Grisdale.
- No. 2. Maximum Crops, 1917, by W. L. Graham.
- No. 3. Varieties of Grain recommended for Use in Canada, by Dr. C. E. Saunders.
- No. 4. Notes on the Cultivation of Some Staple Vegetables, by W. S. Blair.
- No. 5. Preparing Farm Horses for Summer Work, by E. S. Archibald.
- No. 6. Produce more Poultry Products, by F. C. Elford and Geo. Robertson.
- No. 7. The Dairy Cow, by E. S. Archibald.
- No. 8. Feeding of Swine, by Geo. Rothwell.
- No. 9. Recommended Varieties of Field Roots, by F. S. Browne.
- No. 10. Field Beans, by W. L. Graham.

In 1916, crop conditions, on the whole, were much less favourable than those of the record-breaking year 1915. In the Prairie Provinces, the prospects for a good yield of cereals were excellent up to the beginning of August, but during that month a serious attack of rust developed in Manitoba and Saskatchewan, which either destroyed the crop over large areas or materially lowered both yield and grade. Average yields throughout the Dominion were lower than in 1915.

Potatoes were a poor crop in Ontario and Quebec, but good in the Maritime Provinces and fair in the Prairie Provinces and British Columbia. Fodder corn also gave low yields.

Hay and clover gave record returns, with a total yield of 14,799,000 tons, an average of 1.86 tons per acre.

Increased prices helped to offset lower yields. The total value of the field crops of Canada in 1916 is estimated at \$808,054,000, as compared with \$841,297,500 in 1915.

Below are tabulated some data on the yields and value of the principal field crops of Canada in 1916. A table is also given showing the numbers of the principal classes of live stock in the Dominion during 1912-16, inclusive.

HARVESTED Areas, Estimated Yields, and Value of Field Crops, 1916.

Crop.	Area.	Yield per Acre.	Total Yield.	Weight per Measured Bushel.	Average Price per Bushel.	Total Value.
	Acres.	Bush.	Bush.	Lb.	\$	\$
Fall wheat .....	936,600	21.50	20,131,000	59.52	1.53	30,687,000
Spring wheat.....	11,942,900	16.75	200,236,000	56.61	1.29	258,687,000
All wheat.....	12,879,500	17.00	220,367,000	57.10	1.31	289,371,000
Oats .....	9,835,100	35.75	351,174,000	33.86	0.53	187,759,000
Barley .....	1,651,100	25.00	41,318,000	45.66	0.82	34,010,000
Rye .....	145,120	20.00	2,896,400	54.95	1.11	3,205,800
Peas .....	150,280	14.46	2,172,400	59.88	2.22	4,816,000
Beans .....	32,500	12.70	412,600	60.00	5.40	2,228,000
Buckwheat .....	341,500	17.50	5,976,000	46.35	1.07	6,375,000
Mixed grains.....	397,770	25.33	10,077,000	43.13	0.90	9,076,300
Flax .....	605,700	11.75	7,122,300	54.99	2.05	14,581,300
Corn for husking .....	173,000	36.31	6,282,000	56.51	1.07	6,747,000
Potatoes .....	448,800	136.20	61,128,000	.....	0.81	49,654,000
Turnips, mangels, etc.....	156,200	264.24	41,274,000	.....	0.41	16,761,000
		Tons.	Tons.		Per ton.	
Hay and clover.....	7,974,000	1.86	14,799,000	.....	11.52	170,504,000
Fodder corn.....	297,100	6.65	1,976,700	.....	4.92	9,725,300
Sugar beets.....	15,000	4.75	71,000	.....	6.20	440,000
Alfalfa.....	89,780	2.91	261,450	.....	10.70	2,797,300



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## LIVE STOCK IN THE DOMINION.

The following table gives the numbers of the principal classes of live stock in the Dominion for the years 1912-16, inclusive:—

Live Stock.	1912.	1913.	1914.	1915.	1916.
	No.	No.	No.	No.	No.
Canada					
Horses.....	2,692,357	2,866,088	2,947,738	2,996,099	2,999,635
Milch cows.....	2,604,488	2,740,434	2,673,286	2,666,846	2,603,345
Other cattle.....	3,827,373	3,915,687	3,363,531	3,399,155	3,313,519
Sheep.....	2,082,381	2,128,531	2,058,045	2,038,662	1,965,101
Swine.....	3,477,310	3,448,326	3,434,261	3,111,900	2,814,672

## DIVISION OF CHEMISTRY.

The work of this important division during the past year has been satisfactorily prosecuted in spite of the fact that three of the assistant chemists were absent on active military service and great difficulty experienced in temporarily filling their places. It has been found necessary to lay aside for the time being certain of the investigations, but work upon these will be resumed as soon as opportunity permits. A very considerable amount of extra work in connection with the Dominion-wide campaign for an increased production of foodstuffs has fallen upon this division. This has included analytical work, correspondence, addresses, and the writing of special articles on matters pertaining to agricultural operations and farm life.

As already indicated, the chief energies of the division have been directed towards giving assistance to the man on the land, in the care and use of manure, in the choice of fertilizer, in the purchase of feeding stuffs, etc. In this connection from 1,500 to 2,000 samples have been received, examined, and reported on. These included soils, naturally occurring fertilizers, limes and ground limestones, fodders and feeding stuffs, insecticides and fungicides, well waters, etc. We believe that this phase of the division's work has been found of very considerable value to the farming communities.

The total number of samples received for examination, and reported on during the year, was 3,736, about 1,500 of which constituted samples collected in connection with special investigations and matters of research.

The work of examination of flour samples, representatives of flour purchases made by the British War Office through the Department of Agriculture, has continued throughout the year. In all 704 samples have been analyzed as to water-content, and there has also been a very considerable amount of investigatory work done on the various methods in use in this determination, with a view of ascertaining their relative accuracy.

The Meat Inspection Division of the Health of Animals Branch submitted during the year 851 samples of examination and report. These comprised lards, tallows, oils, preserved meats, sausages, colouring matters and dyestuffs, preservatives, pickling solutions, spices and condiments, evaporated apples, and waste, etc. In addition to the analysis of these samples to learn if they met the requirements of the food stan-



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dards, work of an investigatory nature has been undertaken in connection with certain newly introduced cures for meat products, methods of sampling and analysis for vegetable canned goods, and several other matters of considerable importance relating to the products of the packing-house industry.

The investigational work with fertilizers, continues to yield interesting and valuable data. During the past year this experimental work has been extended to other Stations of the system where conditions indicate the desirability of attempting the solution of soil fertility problems by this means.

In this connection the co-operation of a large number of farmers throughout the Maritime Provinces and Quebec was enlisted to test, under varying conditions of soil and climate, the fertilizing value of dried ground seaweed. Many of the results indicate that this material is one of considerable promise in furnishing available nitrogen and potash.

It is satisfactory to note that the large and ever-increasing volume of correspondence on the subject of manures and fertilizers has received prompt attention. Numerous samples of soil submitted to the division with these requests have been examined as to their nature and essential characteristics. The results thus obtained have permitted reports as to the most suitable means for the soil's amelioration.

The interest in the value of lime and ground limestone for the improvement of soils that are sour or naturally deficient in lime continues to increase and, consequent upon this interest, a considerable number of soils have been examined for farmers as to the lime requirements. A number of limestones occurring in various parts of the Dominion have also been analysed with the view of determining their suitability for the manufacture of ground limestone.

In continuation of the investigation to ascertain the suitability of soil and climatic conditions throughout the Dominion for the growth of sugar beets for the production of sugar, varieties have been grown under special culture on the various Farms and Stations of the system, and the product analysed as to sugar-content and purity of juice. The results, as in the past, have been, on the whole, very promising.

The work on the influence of environment on the composition of wheat begun in 1905, has, through the assistance and co-operation of the Meteorological Service, been expanded and now constitutes a study in agricultural meteorology. The correlation of weather condition with crop growth which this extension of the work makes possible, promises to yield results of very considerable importance to Canadian agriculture.

It is gratifying to record that the interest of the farming community in the purity of their home water supply is maintained. There is no more important asset on the farm, looking to the health of the family and the thrift of the stock, than an ample supply of pure water. The results of the analyses of the past year might be taken as indicating more care in the selection of a location for the well and in the means for protecting the supply from pollution.

In the examination of soils from the several irrigation tracts in Alberta, fifty-five groups, comprising 225 samples of soil have been analysed as to their water-soluble saline content. The results have been used by the Irrigation Branch of the Department of the Interior in their re-classification of the areas involved into irrigable and non-irrigable lands.



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## THE DIVISION OF FIELD HUSBANDRY.

The main subdivisions as relating to the investigations being conducted by the Division of Field Husbandry at the Experimental Farms and Stations throughout the Dominion include:—

- (a) Studies in the methods of culture and curing of field crops.
- (b) Investigations of the relative merits of different crop rotations.
- (c) Determinations of the costs of growing field crops under regular farm conditions.
- (d) Tests of the influence of size and character of cultural implements on cost of crop production.
- (e) Comparisons (in a limited way) of varieties of grain and forage crops as food producers.
- (f) Experiments to show the value of underdrainage and irrigation.

At the Central Experimental Farm, Ottawa, work is hampered, due to the fact that suitable land is not available upon which to conduct the several experiments that should naturally be included. The main object at the present time is to provide supplies of fodder and grain for the upkeep of the live stock on the Farm. At the same time the following projects are under consideration:—

- (a) Cost of production of field crops.
- (b) Merits of different crop rotations.
- (c) Methods of cultivation, including a test of deep ploughing versus shallow ploughing and subsoiling.
- (d) Merits of commercial fertilizers as a partial substitute for barnyard manure.
- (e) Value of underdrainage.

## WEATHER CONDITIONS AND CROP NOTES.

The season was most unfavourable for seeding operations. The weather was excessively wet, making work on the land tedious and discouraging. After repeated interruptions, seeding was completed out of season, some areas being sown two and three times to secure a stand. However, growth was rapid, with prospects of a fair harvest. Hay grew luxuriantly, and a bumper crop of good quality resulted. Grain also did well but ripened prematurely, thus giving a low yield of inferior quality. Roots, forage corn, and potatoes were only fair, but favourable harvest weather prevailed. Conditions for fall ploughing, which was completed in good season, were also satisfactory.



COST OF PRODUCTION OF FIELD CROPS.

The data contained in the accompanying table comprise yields, and costs of production of corn, oats, and hay grown under field conditions.

Cost of Production of Field Crops, Central Farm, 1916.

Crops.	Area.	Yield per acre.		Cost to produce.		
	acres.	tons.	bush.	per acre.	per ton.	per bush. cents.
Ensilage corn.....	33	12·46	.....	\$27 44	\$2 20	.....
Oats.....	39	.....	44·4	16 23	.....	28
Oat straw.....	39	1·19	.....	.....	3 26	.....
Hay.....	33	4·62	.....	19 97	4 32	.....

CROP ROTATIONS.

The most important field of investigation is that with crop rotations. This work has been in progress at the Central Farm for many years, and at present thirteen rotations varying in duration and treatment, are permanently located. These rotations are being closely observed and studied, keeping in mind the following factors:—

- (1) Their ability to supply different crops in the proper proportions for certain needs.
- (2) Their power to keep weeds in check.
- (3) Their comparative profit.
- (4) Their effect on the fertility of the soil.

Five regular farm rotations are under way according to the following outline:—

*Rotation “A” (five years’ duration).*—Hoed crop, manured; grain, seeded down with clovers and grass; clover hay, dressed with manure in autumn; timothy hay, field ploughed in August, top worked and ribbed up in October; grain, seeded down with red clover to be ploughed under the following spring when the succeeding hoed crop is corn.

*Rotation “B” (five years’ duration).*—Hoed crop, manured; grain, seeded down with clovers and grass seeds, top dressed with manure in autumn; clover hay, ploughed in autumn; grain seeded down with clovers and grass; clover hay.

*Rotation “C” (four years’ duration).*—Hoed crop, manured; grain, seeded down with clover and grass; clover hay; timothy hay, field ploughed in August, top worked and ribbed up in October.

*Rotation “D” (three years’ duration).*—Hoed crop, manured; grain, seeded down with clovers and grass; clover hay.

*Soiling Crop, Rotation “R” (three years’ duration).*—Corn for early fall feed, manured; peas and oats to cut green, seeded down with clovers and grass; clover hay, to cut green.



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The accompanying table contains the chief items in connection with these rotations:—

## Cost, Returns and Net Profits of Rotations "A," "B," "C," "D," and "R,"

Rotation.	Cost to operate per acre.	Value of returns per acre.	Profit or loss per acre.
	\$ cts.	\$ cts.	\$ cts.
A (five years' duration). ....	17 73	19 32	1 59
B (five years' duration).....	17 58	16 75	0 83
C (four years' duration).....	17 69	17 16	0 53
D (three years' duration) ....	20 29	19 64	0 63
R (three years' duration) .....	18 73	24 66	5 93

The results for all crops in the rotations, with the exception of hay, were low, due largely to the very unsatisfactory weather conditions which prevailed during the seeding and harvesting season for grain especially.

## SHALLOW PLOUGHING AND SUBSOILING VERSUS DEEP PLOUGHING.

This experiment has been under way for thirteen years. Two four-year rotations differing only in the preparation of sod land for corn or roots, as mentioned above, are used, but the results have not yet shown any decided advantage in favour of either method.

## COMMERCIAL FERTILIZER AS A PART SUBSTITUTE FOR BARNYARD MANURE.

This experiment was designed in 1913 to supply information regarding the relative merits in regular farm rotation of:—

- (1) No manure or fertilizer of any kind but pastured one year in four.
- (2) Barnyard manure.
- (3) Complete commercial fertilizer.
- (4) Barnyard manure, together with commercial fertilizer.

The results are in favour of barnyard manure alone over commercial fertilizer alone for this soil, with the possibility of combining the two advantageously under conditions where manure is scarce or high in price.

## DIVISION OF ANIMAL HUSBANDRY.

The Animal Husbandry Division of the Experimental Farms has made a satisfactory expansion in the scope of its work during the past fiscal year. The lines of work which fall to this division are the laying out and the superintending of feeding, breeding, purchasing, management, and housing of farm animals; the manufacturing and marketing of their products, together with all experimental and demonstrational work connected therewith on the Central Experimental Farm, and, in consultation



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with the Director of the Experimental Farms and the Superintendents of branch Farms, the supervision of similar work on branch Farms and Stations throughout Canada.

#### LIVE STOCK ON THE CENTRAL FARM.

The horses on this Farm are all of draught type excepting the necessary drivers. Among the draught horses are a number of excellently bred Clydesdale mares which are used not only for general farm work but also for breeding purposes. An excellent crop of filly foals was obtained during the past year, and already several mares have again dropped valuable foals this spring. Feeding experiments both with the working horses and breeding stock are being continued on the Central Farm in conjunction with somewhat similar work on the branch Farms.

The extremely important work with beef cattle is of necessity still curtailed for lack of sufficient housing accommodation. However, a few choice young steers were finished for baby beef, not only to demonstrate the profits from such work, but also that these animals be used for demonstrational purposes in lectures to the many visitors.

The herds of dairy cattle have improved rapidly during the past year. Good representatives may be found of four breeds, viz., Ayrshires, French Canadians, Holsteins, and Jerseys, as well as a few choice grades of the Ayrshire and Holstein breeds.

The milk production per cow has, amongst all breeds, increased largely during the past year. Some splendid records have been made by animals which were entered both in the Record of Performance and Record of Merit, all breeds showing a marked increase in maximum production and maximum profits. Many pure-bred animals from these herds are annually sold for a moderate price to breeders throughout Canada, it being the object in the making of these sales, to place this stock where the greatest amount of good may be done. A large number of experiments in the feeding, breeding, and handling of dairy cattle have been conducted during the past year. An increasing number of experiments with equipment, such as milking machines, have been conducted. Special attention also has been paid to the feeding and rearing of young stock, and a large number of calf-feeding experiments have been conducted.

Experimental work along the line of dairy manufacturing is continuing to hold a very important place in the work of this division. The manufacturing, curing, and marketing of many dairy products, such as butter, fancy cheeses, cheddar cheese, and the like, has received all attention possible under the existing circumstances. With the construction of a more capacious dairy, the amount of experimental work will be largely increased. From this division also has been distributed, to thousands of Canadian farmers, a large amount of information regarding dairying, as well as free forms for the keeping of cow records.

The sheep on the Central Experimental Farm have again shown a marked improvement both as to numbers, quality, condition, and profits. Only two breeds, viz., Shropshires and Leicesters are represented on this Farm. However, from these flocks a number of excellent breeding animals have been distributed to branch Farms and to sheep breeders throughout Eastern Canada.



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Swine raising has again demonstrated itself as one of the best-paying branches in this division. Three breeds are represented in this herd, viz., Yorkshire, Berkshire, and Tamworth. Large numbers of young pure-bred animals have been sold during the past year for breeding purposes. Again a large number of feeding experiments have been conducted both under summer, fall, and winter conditions; these experiments dealing with more economical feeding, the choosing of superior foodstuffs, both for raising on the farm and to be purchased on the markets, the saving of labour in the feeding of hogs, and many such economic problems.

## ASSISTANCE TO BRANCH FARMS.

The Dominion Animal Husbandman has visited the branch Farms and Stations throughout Canada and continued to be of assistance to the Superintendent of these Farms. In conjunction with the Superintendents, and under the supervision of the Director of the Experimental Farms, many new lines of live-stock work have been initiated. In addition a large number of sketch plans of buildings proposed for these branch Farms and Stations have been made by this division, which plans have been approved of and completed by the Department of Public Works. By such means of co-operation, building work on the branch Farms has been facilitated and the buildings constructed are better adapted both for the purpose for which they are intended and as an example to the farmers in those provinces. It may be again recorded that the modern buildings on the Dominion Experimental Farms are being copied, in their essentials at least, by a large number of both the small and extensive live-stock breeders throughout Canada. Such is then a tremendous influence toward more modern, sanitary, and economical farm structures.

## MISCELLANEOUS.

The regular correspondence of this division has again increased more than 30 per cent over the previous year. Every possible assistance has been given inquiring farmers along the lines of maintenance of live stock, feeds, feeding, methods of breeding and general management for improved health and increased profits. The increase in correspondence again shows the greater confidence which Canadian farmers have in the work of this division.

A most gratifying result of the work is the increasing interest of the Canadian farmer in improving of his live-stock buildings. This division has continued to assist Canadian farmers in every way possible toward the planning of new or the remodelling of old farm buildings. Over 550 blue-prints of modern farm structures to suit the individual needs of farmers inquiring, as well as photographs and brief specifications, have been distributed during the past fiscal year.

Members of the staff of this division have judged at a large number of agricultural fairs, assisted at many agricultural short courses, and have addressed a large number of meetings throughout Eastern Canada during the year ending March 31, 1917.



## DIVISION OF HORTICULTURE.

The season of 1916 was one of the most unfavourable for fruit that has been experienced for many years in Ontario. A very wet spring and early summer was followed by an extremely dry, late summer and early autumn, with the result that disease injured the crop to a marked degree while the weather was wet, and drought injured it when the weather became dry. In the orchards at the Central Experimental Farm, five sprayings were necessary to control the apple scab, and some varieties of apples were sprayed six times. During the month of September apples dropped badly, as the ground had become very dry. Notwithstanding the unfavourable conditions, the largest crop of apples in the history of the Farm was harvested, and other fruits bore medium crops.

*New Apples.*—The many new varieties of apples originated at the Central Experimental Farm have attracted much attention. Collections of these were shown at various exhibitions in 1916. Some of the most valuable are seedlings of McIntosh Red and Northern Spy, there being varieties among them having somewhat the same flavour as these well-known sorts but different in season, thus ensuring a season for apples of the McIntosh type from summer until winter, and of the Northern Spy type from September until late winter, and being hardier than the Northern Spy. The best of these have been named and are being tested at different points throughout Canada. Some of the McIntosh seedlings which are of the greatest promise are named Melba, Joyce, Brock, and Pedro; and of Northern Spy seedlings, Thurso, Rocket, Donald, Elmer, and Niobe. As there are too many varieties of apples already on the market it is not desired to recommend these for general planting until they have been thoroughly tested in a number of places. A bulletin entitled "The Apple in Canada—Its Cultivation and Improvement" was prepared by the Dominion Horticulturist and published during the year.

The varietal and cultural work with fruits, vegetables, and ornamental plants was continued at the Central Farm much as in previous years, although the absence of two assistants on active service was much felt, and the development of certain features of the work was delayed on this account.

The breeding of new varieties of fruits, vegetables, and flowers was continued in 1916, and many new crosses and selections made. The Early Malcolm corn and Alacrity tomato, developed in the Horticultural Division, have proved very desirable varieties and were offered for sale by seedsmen in 1916. Especial attention is being given to the breeding of early and productive varieties of vegetables, as it is believed that there is great need for such in Canada.

About seven acres of land devoted to experiments with vegetables and strawberries was equipped with an overhead system of irrigation in 1915, and in 1916 this was in operation. Owing to the excessive rains, however, until nearly midsummer the strawberries and early vegetables were not in need of artificial irrigation, but it was used on the later vegetables with good results.

The campaign for the utilization of vacant land in 1916 to grow food crops, and the call to Canadians to increase production everywhere, together with the opening of an information bureau to which any one desiring information might apply, resulted



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in greatly increasing the correspondence of the Horticultural Division, as a large proportion of those who wrote desired information in regard to the growing of vegetables. To help meet the demands for such information, two pamphlets were prepared by the Dominion Horticulturist, one of four pages and entitled "The Home Vegetable Garden," and another sixteen page one called "Garden Making on Vacant Lots, and The Home Vegetable Garden." These two pamphlets, of which large editions were published, seem to have met the needs of the people very well, and they have been asked for in large numbers, many cities and towns having taken up the utilization of vacant lots as a civic undertaking. It is believed that the production of vegetables will be greatly increased in 1917.

## BRANCH FARMS AND STATIONS.

The greatest amount of new work in horticulture was done at the two new Experimental Stations at Morden, Man., and Summerland, B.C., in 1916. Little planting had been done at the Morden Station in 1915 with the exception of the planting of Caragana hedges, which were to act as windbreaks for the future orchards, but in 1916 an orchard of between nine and ten acres, consisting of apples, crab apples, and plums was sent out. Between the rows of permanent trees were planted some 27,000 apple seedlings of the hardiest known varieties. These trees, in addition to the Caraganas, will be windbreaks for the named varieties, and from them it is expected to obtain at least a few good hardy sorts. Plantations of brush fruits were sent out, and experiments in the growing of vegetables and ornamental plants begun.

The experimental Station established at Summerland, B.C., in the Okanagan valley, has already made good progress in horticultural work. Orchards of the principal fruits were set out in the spring of 1916, and the trees made a good start. A carefully planned series of irrigation experiments with fruit trees was laid out, from which valuable information should be obtained. Vegetable experiments and experiments with flowers were also carried on in 1916. Already a considerable number of horticulturists have been attracted to this Station which, though established but a short time, has become well known in the valley.

The horticultural work on the older branch Farms and Stations was continued much as usual. There is being accumulated at these places a mass of useful information in regard to horticultural plants and their cultivation and how they succeed in different parts of Canada that is invaluable both to the new and old settlers. These Farms and Stations have also proved bureaus of information to those desiring to grow vegetables during war times to aid the Empire.

## CEREAL DIVISION.

## THE SEASON.

The year 1916 proved one of the least favourable years for cereals since the establishment of the Dominion Experimental Farm system. In some parts of Canada excellent crops were produced, but the areas where small or injured harvests were reaped were unusually large. In the east a great area of country suffered from exces-



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sive rains in spring which continued well into the month of June, with the result that many fields, which would have been sown with cereals, had to be treated in some other way; and among the fields which were sown many were so wet that the young plants started under very adverse conditions. The long period of wet weather was followed very quickly by intense heat which continued almost up to harvest time, and prevented the grain from filling out properly. Such a season was particularly hard on cereals and the yields were almost invariably small throughout the area in question.

In the great grain-growing provinces of Central and Western Canada there were some districts which produced excellent crops, but the total yield of grain in the three provinces was rather low. Rust, frost, and hail all did an unusual amount of damage, though there were some favoured localities which escaped all three. Southern Alberta was perhaps the most fortunate. The worst damage from rust occurred in southern Manitoba and in southeastern Saskatchewan. The damage from this disease became gradually less as one passed from the southeastern towards the northwestern section of the great plains.

An altogether exceptional frost, which occurred about the 10th of August, damaged grain on many of the low-lying fields over a very large section of country in the northern part of the settled portion of Alberta and Saskatchewan.

While there was perhaps no large area of country which suffered particularly from hail, there was unusual damage from this source in many districts, the number of severe storms being quite abnormal.

While it is regrettable that the season of 1916 should have fallen so much below that of 1915, in regard to the yields of cereals, it must be remembered that the previous year was extraordinarily favourable, and any comparisons which are to be made should take into account the average crop for a series of years rather than the wonderful crop of 1915.

#### VARIETY TESTS.

While the weather at Ottawa was decidedly unfavourable for cereals, and while the tests of varieties were therefore carried out with unusual difficulty, nevertheless fairly good results were secured and some progress was made along all lines. At most of the branch Farms good crops were obtained, and useful observations were made at all of them, except at one where the crops were entirely destroyed.

Among the hundreds of new cross-bred varieties and new selections which are under test, a few of the exceptionally promising sorts are now being propagated for more thorough trial in a greater number of localities. It is expected that in the near future at least one new variety of hulless oats, one new variety of hulless barley, and one new variety of hard, red early-ripening wheat will be introduced to the public. This work necessarily proceeds very slowly, as it is important to avoid the mistake of prematurely introducing varieties which have not been sufficiently tested. Many new sorts are now, however, approaching the end of what may be termed their probation period, and among these there are several of great promise.



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## MARQUIS WHEAT.

As usual, this extraordinary variety again won the highest international award last season and, in addition, it created what is probably a world's record for the yield of spring wheat on a large field, when a farmer in southern Alberta harvested 54,395 bushels from 1,000 acres of land. Such a magnificent yield would scarcely be credited were it not properly attested by trustworthy persons.

## FREE DISTRIBUTION OF SEED.

In spite of unusual difficulties, a good stock of seed of the best varieties was secured for the distribution, chiefly from the Experimental Farms at Indian Head, Cap Rouge, and Ste. Anne de la Pocatière. As the farmers have become of late years very critical in regard to the quality of the seed supplied to them, an earnest endeavour is made to send out nothing but the very highest class of grain, and free from all impurities. Many appreciative letters are received from farmers who are delighted with the quality of the grain which they receive.

This year it was thought best to print an application form, on which a series of questions was asked, so as to easily obtain from the applicant a clear statement as to the conditions on his farm. The use of this application form so much facilitated the sending in of satisfactory applications, that a much larger number than usual was accepted. While the distribution is not complete at the time of writing this report, the statement may be made that the total number of samples of grain distributed this winter will be over 7,500, and that, in addition to these, about 3,000 samples of potatoes will also be sent out. This is a considerable increase over the number distributed in the previous year. The grain samples are sent to all parts of Canada, but the samples of potatoes distributed from Ottawa are limited to the provinces of Ontario and Quebec, the other provinces being supplied locally from their own Experimental Farms or Stations.

## DIVISION OF BOTANY.

## DESTRUCTIVE INSECTS AND PEST ACT.

The work in connection with the "plant disease" section under this Act is directed by the Dominion Botanist. During the year, special attention has been devoted to the elimination of diseases of potatoes, by a system of field inspection during the summer, and by the inspection of the crops resulting, during fall and winter months. The systematic work clearly demonstrates the benefits resulting to farmers from attention to the control of diseases conveyed by planting tubers infected with black-leg, scab, rhizoctonia, etc., and particularly from the elimination of those groups of diseases which are conveyed by the tuber, but which do not show any symptoms on the same, as for instance, leaf roll, curly dwarf, mosaic, etc. The work also includes spraying demonstrations against late blight and rot.

## PLANT PATHOLOGY.

Interesting progress has been made in the investigation of various phases of the white pine blister rust. This rust is destructive to all five-leaved pines, and also affects



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wild and cultivated currants which act as secondary hosts. This important disease will receive increased attention in the near future, as it is being realized that otherwise serious damage may result to these valuable resources of our forests. Likewise, good progress is being made by the various field laboratories, of which three are now in full working order.

The St. Catharines laboratory continues its investigation of fruit-tree diseases, and a publication on the control of peach canker, which has now been satisfactorily worked out, is contemplated in the near future. The officer in charge also devotes considerable time to the problem of white-pine blister rust, which is firmly established throughout the Niagara peninsula.

The laboratory at Charlottetown for Prince Edward Island, and temporarily for Nova Scotia, has devoted much time and attention to the improvement of the Bermuda seed potato industry. The Bermuda growers obtain most of their requirements of the potato variety "Garnet Chile" from Nova Scotia, and during recent years it was found that certain strains of this variety from Nova Scotia resulted in serious failures when planted in Bermuda. The work done to prevent such losses to the Bermuda farmers, and most likely the loss of trade in this variety for the Nova Scotia growers, has been very successful and is being highly appreciated in Nova Scotia and Bermuda. Several special publications were issued by the officer in charge, on the control of Late Blight, Black-leg and Mosaic diseases of potatoes. Experiments were also conducted in Nova Scotia with dusting compounds for the control of apple scab, which have so far not been conclusive, though promising.

The laboratory for New Brunswick and Quebec has also much progress to report. The organization of the producers of potatoes, aiming at the improvement of the potato industry as far as freedom from disease, purity of variety, and increase in yield is concerned, has found many supporters.

Among the experiments may be mentioned, "control of club root," "Experiments on the control of powdery scab of potatoes," besides a general plant disease survey over the two provinces.

The Central laboratory finds its time very fully occupied by attention to the numerous inquiries received from farmers all over the Dominion.

The demand for nitro-cultures for legumes has increased tenfold since last year, and the first returns are now being received, which clearly indicate the advantages of treated seed versus untreated seed. Pure cultures are much more reliable in their results, and far more easily applied.

Of the more outstanding features of the work may be mentioned the activity of the divisional officers in connection with the blister rust of pines; various phases of research work were outlined, and experiments were conducted. The department participated in several conferences, held in Albany, N.Y., and Washington, D.C., being represented at these meetings by a special delegate.

During the year the Dominion Botanist investigated the cause and effect of one of the most destructive rust epidemics affecting principally the spring wheat in the western provinces, and the establishment of two new field laboratories for research on rust and grain diseases was authorized. One of these laboratories is situated at Brandon, Man., the other at Indian Head, Sask. Towards the close of the fiscal year



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the appointment of Mr. W. A. Fraser, M.A., was authorized, to take charge of this special and highly technical work. Mr. Fraser, formerly Assistant Professor of Biology at Macdonald College, is regarded as an eminent authority on rust diseases, and his appointment promises results of value to the grain-growing provinces particularly. The Dominion Botanist suggested and had designed by one of his technical assistants—an experienced artist—material for a coloured poster on black or stem rust of wheat, which, together with an authoritative statement, will form a very acceptable and instructive publication. The poster just came to hand at the close of the year, and will be widely distributed throughout the western provinces.

## ECONOMIC BOTANY.

During the past year more than 1,000 species of plants were received for identification, some of these being weeds, some medicinal, and others poisonous.

Considerable progress was made in connection with the herbarium, 628 mounted sheets having been added to the collection.

As in previous years, an exchange list of 429 species of plants was sent out to the leading botanical gardens of the world; 584 packets of seeds were received, and 697 packets were sent out.

Some experimental work on flax commenced in the previous year was completed, the flax fibre being pronounced by an expert as the finest he had yet seen in Canada.

Several plots of hemp for seed and fibre were grown, the report on the latter from the Doon Twines Company, Limited, being quite favourable.

Several varieties of Soy beans ripened their seeds satisfactorily, as also did several plots devoted to the culture of the Castor Oil plant.

Both black and white mustard, as the result of experiments carried on during the year, appear to be well suited to the climate of Canada.

Chicory roots, grown here during last season, were reported on by the Dominion Chicory Company as being "excellent in every way."

The summer of 1916 was specially favourable for the growth of broom corn, but the report of the Parker Broom Company, on the sample submitted, would indicate that for purposes of manufacture this crop is hardly suitable for the Ottawa district.

Several species of medicinal plants, of which the more important were opium poppy, anise, dill, belladonna, etc., were grown with fairly satisfactory results.

The use of chemical solutions of iron sulphate and sodium arsenite, as a remedy for noxious weeds, was tested in the case of dandelion on lawns, wild mustard, and Canada thistle, with favourable results.

## DIVISION OF FORAGE PLANTS.

The scope of the work of the Division of Forage Plants is gradually being extended. New lines are taken up every year as the work progresses, the most important ones this year being production of seed of various forage plants and experiments with grass and clover mixtures for hay and pasture.



## VARIETY TESTS.

A great number of varieties of field roots, including mangels, swede and fall turnips, carrots, and sugar beets, and also of Indian corn were tested as usual. Owing, however, to the very adverse climatic conditions, especially in the spring and early summer, the variety tests with the said crops did not give as good results as they usually do.

## BREEDING WORK.

The breeding work is progressing very satisfactorily. It includes work with alfalfa, red clover, timothy, orchard grass, western rye grass, red top, meadow fescue, Kentucky Blue grass, English rye grass, mangels, and swede turnips.

In previous reports it has been explained that the breeding work with alfalfa has for its main object the production of hardy, uniform strains of superior-yielding capacity. It is gratifying to be able to report that, this year, several hardy strains which has been developed during the last few years showed almost complete uniformity, when reproduced by seed.

The breeding work with red clover is conducted chiefly with a view of producing hardy and, as a consequence, high-yielding varieties, it having been demonstrated through previous experiments that there exists a direct relation between degree of hardiness and yielding capacity in different so-called red clover varieties. Several "strains" have been developed which, according to experiences gained so far, are perfectly hardy in the Ottawa district.

The breeding work with grasses is also progressing satisfactorily. Most advanced is the work with Western rye and timothy, of which quite a number of uniform varieties are being developed.

## SEED-GROWING EXPERIMENTS.

The experiments with field root seed growing, so successfully started in 1915, were repeated this year and gave results similar to those of last year's, i.e., they indicated, most decidedly, that seed of good quality can be raised in the Dominion and that seed raising, if carefully undertaken, is a rather profitable business.

In addition to the seed-growing experiments with field roots, some work was started this year with seed raising of alfalfa, red clover, and timothy. The principal object of these experiments, besides furnishing data as to yields and profits, is to ascertain what cultural methods give best results.

## VALUE OF CANADIAN-GROWN SEED.

In order to test the veracity of the statements, often made in recent years, that home-grown seed of such crops as mangels, turnips, and carrots is at least as good as imported seed, a great number of experiments were conducted, not only at the various Farms and Stations belonging to the Experimental Farms' system, but also with private farmers, in most cases members of the Canadian Seed Growers' Association. Several varieties of mangels and turnips, seed of which was produced, in 1915, at the



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Central Experimental Farm, Ottawa, Experimental Station, Charlottetown, P.E.I., Experimental Station, Kentville, N.S., Experimental Station, Fredericton, N.B., Experimental Station, Lennoxville, Que., and the Experimental Farm, Agassiz, B.C., were sown in comparison with ordinary commercial seed of the same varieties. The results were very much in favour of the Canadian-grown seed, as the crops realized from it were, in the vast majority of cases, larger than those obtained from commercial seed.

## MISCELLANEOUS.

The herbarium material of grasses and kindred plants was largely added to this year, especially with forms from the foothills of the Rocky mountains, the district around Prince Rupert, B.C., and the Yukon Territory.

In this connection it may be stated that arrangements were made with the Canadian Klondike Mining Company, Dawson, Y.T., to conduct a large number of experiments of forage plants in the Klondike valley, the chief object being to investigate the hay-growing possibilities in the Yukon Territory.

## DIVISION OF BEES.

The outstanding feature of the year 1916 was the unusually large crops of honey from alsike and white clover produced in Ontario, Quebec, and Manitoba, principally due to the wet spring followed by fine warm weather when the plants were in flower. The honey was sold at a fractional advance on the prices obtained the previous year, and was quickly bought up by housekeepers, sugar and canned fruits being high.

Bees are now being kept on fifteen of the Dominion Experimental Farms. The highest production in 1916 was at Ottawa, where thirty-five colonies produced 8,269 pounds of honey, an average production of 236 pounds, or \$30.77 per colony. Ste. Anne de la Pocatière, Que., came second, producing 132 pounds per colony, and Invermere, B.C., third, with 118 pounds per colony.

During the summer of 1916 the apiarist visited each of the Farms at which bees are kept, and made detours into promising regions for honey production, visiting apiaries and investigating in detail the species of plants from which the honey is gathered, and the weather conditions favourable for abundant production. The conclusion was reached that honey crops that will compare favourably in size and quality with those to be obtained in the best regions in North America may be secured in selected places in the Ottawa River basin, especially in some of its northern valleys, where alsike and white clover, fireweed, and certain species of golden rod and aster form successive sources of honey. For the fuller investigation of this region, co-operative experiments with experienced beekeepers having apiaries situated at Montcerf, Que., Lytton, Que., and Thornloe, Ont., were carried out in 1916. Colonies of bees were also taken from Ottawa to representative locations at Sully, Que., and Kazubazua, Que., for the summer.

Other promising regions visited by the apiarist were the districts south and southeast of lake Winnipeg, certain rich farming and swamp lands in the Maritime Provinces, and the alfalfa districts of southern Alberta. Two days spent at Melfort,



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Sask., indicate that beekeeping is worthy of attention as a side line in this district. An extension of the system of co-operative experiments to these and other districts has been organized.

Further study of the wild bees believed to be instrumental in pollinating alfalfa was made by the apiarist in southern Alberta.

Wintering bees outside, four hives packed in shavings in a case, in an inclosure sheltered from wind, without attention during the winter, continues to prove successful in Ottawa, the average results of the last four years showing that the bees so wintered did better than those wintered in the cellar.

An experiment in importing bees without combs by express from the south in spring was made at Ottawa and showed good promise.

Containers for granulated honey made of white bond paper waterproofed with paraffin wax have been tried as an alternative for tin cans, the cost of which has greatly increased.

The large earnings of beekeepers in East-Central Canada in 1916 has stimulated an increased interest in bees, and there has been a heavy demand for our new bulletin "Bees and How to Keep Them," published during the year, especially the French edition.

The continued high rate of increase in the correspondence of the division, and calls to the apiarist, to which he responded, to contribute papers to the annual convention of the Ontario Beekeepers' Association at Toronto, the Quebec Beekeepers' Association at Montreal, the Beekeepers' Association of British Columbia at Vancouver, and the Manitoba Beekeepers' Association, the first three of which he attended in person, as well as from several smaller organizations and the press, serve to indicate the growing service that the Bee Division has been called upon and has been enabled to give.

#### POULTRY DIVISION.

As usual the work in the Poultry Department includes experiments along all lines that are of interest to the poultry producer.

This year special attention has been given to experiments on the cost of feeds, cost of production, incubation, brooding, diseases, etc. Experiments along these lines have been conducted at the Central plant and also to a limited extent at the various branch Farms.

#### ALTERATIONS TO CENTRAL PLANT.

During the year the Central plant has been rearranged to make it more convenient for the visitors to be able to see the plant and stock without the danger of having the experiments interfered with. A new entrance has been made to the front of the plant connected with a driveway which runs lengthwise of the plant parallel with Maple avenue.

The turkey plant has been refenced and two subways placed beneath the sidewalk. These subways connect the original plant with a portion of the forest belt that borders the Farm.



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In order to assist in the turkey experiments, a small, rough farm of thirty acres was rented, upon which the range turkeys were reared. The young turkeys were placed on this farm when hatched, and remained there until fall.

## HOUSES.

A hot-water pipe brooder house has been erected and is in use for the early spring chicks. This house was much needed for the early hatches and, so far, is proving quite satisfactory.

Unfortunately the water-fowl house on the duck plant was burned in the fall, which necessitated the transferring of the ducks and geese to the upper plant for the winter.

The work at those branch Farms upon which poultry is kept has been made more efficient by the completion of most of the buildings and equipment, and the installing of a fuller stock of birds. Owing to enlistment and the demand for men in commercial lines it has been difficult to retain some of the poultry men, and it was necessary to make shifts sometimes when most inconvenient.

## DISEASES.

Through the courtesy of Dr. Torrence, Veterinary Director General, Dr. A. B. Wickware, Assistant Biologist, has been assigned to poultry work. This makes it possible to carry on investigation in poultry diseases that up to this time was not possible. Considerable work along poultry disease investigation is being conducted, and we are looking for good results in this department.

## EXTENSION.

Even more than usual has the demand this year for poultry lectures, judges, etc. With the exception of Mr. Fortier, it has not been possible for the members of the staff to accede to this demand. Mr. Fortier, however, has had much of his time occupied in this way, and owing to lack of time many of the requests for lectures, etc., have had to be refused.

The survey work, started over a year ago, has apparently been very much appreciated, and has been the means of improving poultry conditions in the sections where the work has been conducted. During the year a second block of farmers in the province of Quebec has been selected. This block is in the vicinity of Ste. Anne de la Pocatière Experimental Station. Similar work to that which is carried on at Cap Rouge is being conducted there.

Through the Illustration Station Division, eggs have been distributed to the farmers operating these farms. The Experimental Farms or Stations in the three provinces, where this illustration work is being conducted, supplied to each of the Farms two settings of Barred Rock or White Wyandotte eggs. From these eggs very satisfactory reports have been received.

During the winter and spring there has been an increased demand for poultry information, through correspondence and through visitors. The high price of living,



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coupled with the encouragement the Government is giving, seems to have stimulated more persons than usual to take up poultry-keeping. The inquiries come from those who live in towns and cities, as well as from farmers and specialists.

#### TOBACCO DIVISION.

The season of 1916 was no more favourable to tobacco growing than to most other crops. Speaking generally, the summer was too cool, and the rainfall was excessive.

At Ottawa the tobacco suffered from sharp alternations between heavy rainfall and drought. The latter, especially, prevented the full development of the tobacco plants.

In the province of Quebec the proportion of wrapper tobacco was considerably reduced by the poor development of the leaves on most plantations. The only areas spared were some hilly sections, having light, easily-drained soil, and which, in a normal season, give a yield below the average.

In Ontario the situation was slightly better, and, despite the unfavourable season, the yield was not too greatly below the normal.

The shortage in the tobacco crop generally throughout Canada led to a marked rise in prices. Ontario White Burleys at from 12 to 15 cents per pound. In Quebec the demand for the varieties grown there was very active, from 16 to 17 cents per pound being paid for a first-class product.

The short crop of wrapper and binder tobacco in the United States raised the price of these grades in Canada materially. Canadian-grown wrapper tobacco sold at 40 cents a pound and binder tobacco at from 30 to 35 cents.

The fact that such high prices were paid for the Canadian products would seem to indicate that the quality of the leaf was found satisfactory by the cigar manufacturer.

The growing of the yellow, hot-air cured tobaccos of the Virginia type, continues to increase rapidly in Ontario. The crop of 1916, about 500 tons, was the greatest yet produced.

The inspection work, as yet confined to Ontario, is already producing results. About one thousand farmers were visited, their tobacco crops examined, and tobacco growing problems discussed.

In the preparation of tobacco for the market the study of the fermentation of Canadian tobacco, with a view to its utilization in cigar manufacture, has been continued. It has already been shown in a general way that certain varieties are suitable for this purpose, and it has been also shown that the strength of such tobaccos may be reduced by successive fermentations. However, much work yet remains in order to determine the best method to obtain a mild, fragrant tobacco, without excess of free ammonia, and suitable for the manufacture of cigars.

From the Harrow Tobacco Station a distribution of White Burley seed was made, and from that at St. Cesaire, Que., a distribution of Comstack Spanish. In all, over 8,000 samples were sent out.

Inquiries from tobacco growers become more numerous each year. In addition to this correspondence, a number of articles on tobacco growing in Canada were prepared by this division, and appeared in the agricultural press and trade journals.



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## DIVISION OF ECONOMIC FIBRE PRODUCTION.

During the past year a new division has been organized in connection with the Experimental Farms Branch, called the Division of Economic Fibre Production. The object of this division is to carry on experimental work with fibre plants and to investigate fibre production and manipulation in Canada. Investigational work is being carried on more especially with reference to flax and flax fibre.

A complete experimental flax mill has been erected on the Central Farm at Ottawa. The mill is being equipped largely with the machinery at present in use in flax mills, but provision is being made for the installation of new machinery in order to determine the efficiency and economy of some of the newer inventions. The mill is provided with three tanks for water-retting experiments. It is also provided with drying chambers in order to determine whether the costly system of field drying can be dispensed with.

In addition to mill experiments, field experimental work with both flax and hemp is being conducted. These experiments are being carried on with a view to determining what areas in Canada are suitable to fibre production; what varieties and strains of seed are best suited to different localities; the proper amount of seed to sow per acre; the right stage to sow and harvest fibre crops; the extent to which flax reduces the fertility of the soil; and what fertilizers can be economically used with fibre plants.

During the past season experimental plots of flax, consisting of one acre each, were grown in various parts of Canada. While no conclusions can be drawn until fibre tests are made, it would seem that excellent fibre flax can be produced in many different sections of Canada. The Maritime Provinces, Quebec, Ontario, and British Columbia would seem to have special possibilities along this line.

Investigational work is being carried on as to the possibility of utilizing western seed flax straw for such commercial purposes as upholstering tow, fibre board and paper manufacture. Up to the present most of the work of this division has been along the lines of preliminary investigation, but it is hoped some concrete results will be available for publication another year.

## DIVISION OF ILLUSTRATIVE STATIONS.

This being the second season during which the Illustration Stations have been in operation in the province of Alberta and Saskatchewan, results of the work carried on are now noticeable, particularly with the production of good seed.

The department undertakes, for the first year, to supply farmers operating the Stations, with the best seed procurable.

The varieties of seed chosen are selected and tested varieties grown on the Dominion Experimental Farms and proven most suitable to the climate and soil in which the Illustration Stations are located. In 1915, choice seed wheat was sown on the Illustration Stations, each having  $17\frac{1}{2}$  acres, which gave an average of  $39\frac{1}{2}$  bushels per acre. Each farmer also had 5 acres of Banner oats, which gave an average yield of 73 bushels per acre.



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The farmers operating the Stations were allowed to reserve a certain quantity for their own seeding, the balance of the good seed being sold to farmers of the neighbourhood, at reasonable prices. In most districts farmers took advantage of this opportunity to secure well-graded seed. This year the advantage of good, well-graded seed is shown in several instances. The good seed, being nearly all of one variety, ripened earlier and gave a larger yield per acre than the poorly graded seed. Although the ripening season was late, in several instances the Marquis wheat grown on the Illustration fields and the crops grown from seed secured from the Illustration Stations were either ripe or far enough advanced to escape much injury from the early frosts. So noticeable has this been that farmers, when passing, made inquiries as to the variety of the grain growing, and in many instances gave orders for the seed.

#### FORAGE CROPS.

One of the special features of the work of the Illustration Stations is the introduction of good forage crops. Now that the prairie is being rapidly broken, and more live stock being pastured, farmers are finding it more difficult to secure sufficient prairie hay to carry them over winter, especially those going more into live-stock farming.

Two years ago this division made provision for two acres to be sown with western rye grass on each of the Illustration Stations. This season's crop in every instance has been very satisfactory. Reports to hand give yields of from two to three tons of dried fodder, and as high as 760 pounds per acre of pure clean seed was harvested, which seed was sold to the farmers in the immediate district. The rye grass from which the seed was threshed was well cured and made good feed for live stock during the winter. During the past season many special inquiries have been made as to where the seed for this forage crop could be purchased, how much seed should be sown per acre, and many other questions.

Alfalfa sown in 1915 has this year yielded heavy crops of excellent fodder, several stations recording as high as two and two and a half tons per acre. Next season it is the intention to save seed from as many fields as possible.

The alfalfa fields seeded in 1916 made a strong growth and a good stand was left as a cover to the roots over winter.

#### GARDENS.

No farm home is complete without a vegetable, fruit, and flower garden, and it is a pleasure to state that several stations had good gardens in 1916, although many others had none whatever.

The Dominion Horticulturist arranged and sent a suitable collection of seed to each Illustration Station. Several kinds of seed, which had been generated and their suitability tested on the Central Experimental Farm, were sent along with instructions and record sheets so that notes might be taken as to their suitability to the different sections of the Dominion. One pleasing feature about the gardens is the interest taken in them by the women and children, as in many cases they do all the work, and find it both instructive and profitable.



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## POTATOES.

Potatoes are used in every home in Canada, and little thought is given to varieties having good cooking qualities.

In 1916 the Experimental Farms supplied each operator of the Illustration Stations with two bags of the leading variety which had given good yields for a number of years, had good cooking qualities, shallow eyes and good shape, the object being to grow large quantities of good seed and also to have large quantities of one variety or at least one type of potatoes for sale. Farmers have suffered in having to accept lower prices because it was so difficult for a potato buyer to go into a country point and make up a full car of potatoes of an even gradé in colour, size or in quality. Each farmer would offer a different variety which would mean a different colour and different qualities.

The potato crop in the province of Quebec varied. In the eastern section, potatoes were a big average crop, while in central Quebec the crop was extremely light. Potatoes in Saskatchewan and Alberta were fairly good, yielding from 150 to 300 bushels per acre.

## POULTRY.

While the chief object of the Illustration Stations is soil cultivation and crop production, other departments of the farm receive more or less attention from the instructors.

One of the departments, in which all farms are interested and upon which considerable information is asked, is poultry. The flocks, as a rule, are not what they might be, in most cases being a mongrel lot, without suitable care and housing. After consultation with the Poultry Division at Ottawa it was decided to send from the branch Experimental Farms in the respective provinces, two settings of eggs to each of the Illustration Stations.

Therefore, in the spring of 1916, two settings were supplied the operators of the Illustration Stations.

Arrangements are made with the operators of the Illustration Stations to sell, at reasonable prices, settings of eggs or spare cockerels to persons wishing to purchase for breeding purposes.

The results from the first year's effort in this department are very encouraging. On some farms there have been this winter, a small bunch of pullets that will be used for breeding this spring. In several cases good cockerels were sold to neighbours, one operator of an Illustration Station in Saskatchewan supplying eight good breeding cockerels to his neighbours.

## VISITS.

During the season, each Illustration Station was visited at least once each month by the inspector having charge of the work in each province, or by the supervisor. The object of these visits is to instruct the operators as to the best methods of cultivation and crop rotations, and also to give advice on general farm work.

The inspector for the province of Alberta, Mr. J. F. Irwin, made a total of one hundred and one visits, while the supervisor made one visit to each of the fifteen stations in that province.



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The inspector for the province of Saskatchewan, Mr. E. C. Sackville, made seventy-five visits, while the supervisor made twenty visits to the fourteen Stations in the province.

The inspector for the province of Quebec, Mr. J. E. Montreuil, made eighty-two visits, and the supervisor twenty-eight to the ten stations.

#### MEETINGS.

During the year, eleven meetings were held in Alberta, five in Saskatchewan, and twenty in Quebec by the supervisor and the inspectors, assisted by the Director of Experimental Farms and other speakers from the Department of Agriculture. The operators of the Stations gave their experiences and results with the work, which greatly interested the farmers of the district.

A special feature has been introduced, that of holding meetings on the farms on which the illustration work is being conducted.

In this way farmers derive a great deal of benefit from seeing the crops grow and having the kind of crop and method of cultivation explained on the field.

#### DIVISION OF EXTENSION AND PUBLICITY.

The work of this division has materially expended during the year. An Experimental Farms exhibit was staged, under its supervision, at 166 places throughout the Dominion. Had it not been for the clashing of dates in the case of some of the smaller fairs, and the fact that at some points the fair buildings had been taken over for military purposes, the number would have been considerably greater.

For distribution at these fairs, a number of additional exhibition circulars were brought out, there being now almost a hundred circulars in the series.

Numbers 5, 6, and 7 of "Seasonable Hints" were issued.

The efforts to increase the departmental mailing lists were continued, by means of taking names at exhibitions, by extending an invitation to join the list in each issue of "Seasonable Hints," and by mailing return cards to farmers. In these various ways, the division has increased the mailing lists by 42,450 names during the year.

The multigraphs operated in this division, in addition to handling a large amount of form work for the various divisions and branch Farms, have rendered possible the issuing to the agricultural press of a number of timely articles on a variety of farming topics. These have met with a very favourable reception, and it is planned to continue them during the coming year.

#### EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.

Spring work started about a week earlier than for a number of years, and all cereals were sown by the end of May. Ample rainfall and good growing weather brought crops on rapidly. Hay and clover gave excellent crops, while the yields of cereals were higher than the average, although wheat suffered a little from blight and insects. Potatoes and corn gave full crops. Fall pastures remained good, and live stock went into the stable for winter in good condition.



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Experimental steer feeding was carried on during the winter, and good prices were realized for the finished animals.

No building operations of any importance were carried on at this Station during the year.

## EXPERIMENTAL STATION, KENTVILLE, N.S.

Spring opened with fairly moderate weather, and by the end of May seeding operations were well advanced. Moderate rains in June resulted in a splendid growth of all farm crops, but was not so satisfactory for fruit. Hay gave a much better crop than the previous year, but owing to dark weather in July, its curing was considerably delayed. Dry weather in August caused the roots and potatoes to suffer greatly, but corn was unusually good. The grain crop, on the whole, was a good one, and the apple crop was of good quality.

Experimental work in steer feeding was carried on during the winter.

No buildings were erected during the season at this Station.

## EXPERIMENTAL FARM, NAPPAN, N.S.

Farming operations commenced about two weeks earlier than usual, and practically all grain was sown before the end of May. Cold and wet weather during June, however, retarded growth. Good weather in August enabled the hay crop to be cured and stored satisfactorily. Grain and root crops were good, while corn gave exceptionally good returns. The apple crop was light.

Some 35 acres were chopped, cleared, and stumped by the interned prisoners during the season.

A number of steers were purchased for experimental feeding in November, and a new steer-feeding shed was built. Various repairs were made to the older buildings on the Farm.

## EXPERIMENTAL STATION, FREDERICTON, N.B.

The spring was very dry, and farming operations began well, but heavy rains in June delayed seeding considerably. Heavy floods injured the crops on the low-lying land, but on the higher land the yield of hay was very heavy. The weather during July and August was most favourable for crop growth. The grain crop was good, but potatoes only yielded about 75 per cent of the average crop. Corn and roots also yielded well.

The pumping station, destroyed by fire in 1914, was rebuilt. Three colony houses for poultry were also built, and various repairs to old buildings carried out. A plant pathological laboratory in connection with the Division of Botany was erected.

## EXPERIMENTAL STATION, STE. ANNE DE LA POCATIÈRE, QUE.

Spring opened much earlier than usual, and seeding operations were started in good time, but were considerably hindered by rainy weather in early June. A severe drought was experienced in July and August, and this lowered the yields of all grains, potatoes, and hay. Good crops of roots were obtained.

A large amount of drainage work was carried on during the season.

Several buildings, commenced last year, were completed, and a new permanent poultry house was erected.



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## EXPERIMENTAL STATION, CAP ROUGE, QUE.

Although unfavourable weather caused some delay in seeding operations in the district, this work was completed at the Station at about the usual time. Hay gave good crops, while cereals and roots were about the average.

A number of buildings on the Station were repaired during the season, but no new buildings of any importance were erected.

An additional area of some eight acres, lying at the northeast corner of the Station, was purchased and added to the Station area.

A great deal of work with live stock was carried on during the season.

## EXPERIMENTAL STATION, LENNOXVILLE, QUE.

Heavy rainfall during May held back seeding operations somewhat, especially on the low-lying land, and continued rain made haying very late, but this crop turned out very well, and was saved in good condition. The yield of grain was light, but corn produced a good crop. Potatoes gave only a light yield.

A new dairy barn was built during the season, and a dairy herd installed. Live stock work with sheep and steers for feeding experiments was also carried on.

A large amount of drainage work was accomplished.

## EXPERIMENTAL STATION, SPIRIT LAKE, QUE.

Preparatory work was carried on at this new Station under a foreman-manager. The interned prisoners formerly kept at Spirit Lake were removed, and the Station is now entirely under the charge of this department. Horses, implements, and other equipment have been purchased and installed, and a considerable amount of clearing and drainage work carried on.

A fairly large area has now been cleared, and will be ready for cropping in 1917.

## EXPERIMENTAL STATION, KAPUSKASING, ONT.

A certain amount of clearing work has been carried on at this Station under the supervision of a foreman-manager, in preparation for cultivation and cropping this year.

A new barn, office building, and house for the stableman have been erected, as well as a water tank and power. A pump has been installed and a water system laid to maintain the water supply. Most of the lumber for the new buildings was cut, sawn and prepared on the Station.

## EXPERIMENTAL STATION, MORDEN, MAN.

Further work with field crops and live stock has been carried on at Morden during the past season, and further work in the organization of the Station has been continued. Work in horticulture has also been commenced. A new office building has been erected.

## EXPERIMENTAL FARM, BRANDON, MAN.

Cold weather in the spring delayed seeding operations somewhat, but better weather during June and July gave promise that a normal crop would be obtained. However,



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an attack of black rust, first noticed at the end of July, practically destroyed the wheat crop, and late oats and barley were also affected slightly; consequently, the cereal crop was much below average. A heavy yield of hay was harvested, and corn did well.

The main barn was remodelled during the season, but a disastrous fire occurred in December, which destroyed all the barns, together with feed, machinery, and other equipment. All the live stock, however, were saved. A temporary roof was put over the basement of the main barn, in order to house the live stock during the winter.

A plant pathological laboratory, in connection with the Division of Botany, was erected in the fall.

Experimental work in feeding steers has been carried on, all the animals showing good gains.

## EXPERIMENTAL FARM, INDIAN HEAD SASK.

Seeding operations were delayed considerably by a cold spring, but more favourable weather in June and July caused the crops to make good growth. A large yield of hay was obtained. Some damage to root crops and corn was done by cutworms, and warm, damp weather in August caused rust to make its appearance, destroying a considerable amount of the wheat and late-sown oat and barley crops. Potatoes, fodder corn, and roots gave good yields.

A poultry administration building was erected, and also a plant pathological laboratory to facilitate work in the study of plant diseases.

Experimental work with steer feeding was carried on, and the finished animals were sold at an excellent profit.

## EXPERIMENTAL STATION, ROSTHERN, SASK.

A late spring delayed seeding at this Station, so that much of the crop was not put in until the middle of June. Dry weather in June caused the hay crop to be much smaller than usual. The grain crop promised well, but was totally destroyed by a severe hail-storm in August. The vegetable and flower gardens were also destroyed.

A new sheep barn was erected during the season at this Station.

Live stock work in the experimental feeding of steers was carried on during the winter.

## EXPERIMENTAL STATION, SCOTT, SASK.

Owing to cold weather in April, seeding was not started until later than usual, while rainy weather in May delayed operations still further. Warm weather in June and July brought on the cereal and hay crops rapidly, the hay yielding well. Although several hail-storms did some damage in the district, the crops at the Station did not suffer in this regard. Potatoes gave a good crop.

A new sheep barn and steer-feeding sheds were built.

A herd of steers for experimental feeding was purchased in the fall.

## EXPERIMENTAL STATION, LETHBRIDGE, ALTA.

The season at Lethbridge was normal. The hay crop was a little below the average. Slight hail-storms early in the season damaged the apple blossom, but did no



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damage to the other crops. Some rust was noticed in the district, but no damage was done at the Station. The grain crops in general were good, and potatoes and roots also gave good yields.

Steers and lambs were purchased in the fall for feeding experiments.

No building operations were carried on this year.

#### EXPERIMENTAL STATION, LACOMBE, ALTA.

Favourable weather in April allowed most of the grain to be seeded by the end of the month. A cold spell in May retarded growth a little, but prospects for an average crop were good. Unfavourable weather interfered somewhat with haymaking, and wet weather at harvest-time held back the gathering of the grain crops considerably. A killing frost in August did considerable damage to crops in some sections, and, although the yields were as high as usual, the grading was lower.

Work with live stock, including steer-feeding, was carried on during the season.

#### EXPERIMENTAL STATION, SUMMERLAND, B.C.

Preparatory work was continued at this Station. Some field crops were grown, and work in horticulture continued. Irrigation work was carried out, and a further quantity of fluming put up in this connection.

Experimental work in steer-feeding was carried on during the winter.

No permanent buildings have as yet been erected at this Station.

#### EXPERIMENTAL STATION, INVERMERE, B.C.

Exceptionally cold weather at the beginning of the growing season retarded growth considerably, but more favourable weather in July caused the crops to make good progress. Some damage to root and vegetable crops was caused by cut-worms. The alfalfa and clover crops were very good, while the grain yield and fruit crop were about average.

Some work in road-making was carried on during the season, but no new buildings were put up.

#### EXPERIMENTAL FARM, AGASSIZ, B.C.

Cold, wet weather in the early spring delayed seeding considerably, but the weather later in the season being more favourable, the crops made good progress. The hay crop was very good, and the cereal crops were about the average, good weather during August and September allowed harvesting operations to be carried out satisfactorily.

A great deal of work with live stock, including beef and dairy cattle, sheep and swine was carried on during the season, most of the animals giving good returns.

No building operations of any importance were carried on during the year.

#### EXPERIMENTAL STATION, SIDNEY, B.C.

Field crops of cereals and forage plants were grown and variety tests of fruits and vegetables made. Corn for ensilage and alfalfa gave good crops, but root crops



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were lighter than usual. The hay crop was good, and grain gave larger yields than expected. Pastures were a little short and dry, making it necessary to feed green corn. The quality of the orchard fruits was excellent and the yield a good one.

Some work in fencing, drainage, and laying out areas for various lines of work on the Station was carried out, and a shed for steer-feeding work and two poultry houses were erected during the season.

## SUBSTATIONS.

Experimental work was continued at Forts Smith, Resolution, and Providence, in the Northwest Territories, Fort Vermilion, Grouard, and Beaverlodge, in northern Alberta, Salmon Arm in British Columbia, and Minto Bridge in the Yukon Territory.

Reports received from these points, together with samples of grain grown, proved of great value in obtaining information as to the agricultural possibilities at these far-distant points.

## HEALTH OF ANIMALS BRANCH.

The Contagious Diseases Division of this branch is maintained for the purpose of preventing the introduction of the contagious animal diseases from outside sources, for the control and eradication of these diseases in the country, as well as the conduct of experimental and research work to determine certain facts, and to obtain definite knowledge to enable the department to deal intelligently with the many problems continually confronting it.

Although two pathologists and nineteen other officers of this division are on active service in Europe, there has been, during the past year, no cessation of activity in the various lines of work conducted in this division. While this has necessitated the making of many changes, the efforts to protect the live stock of the country from disease have been faithfully continued, not only in guarding against its introduction from abroad, but by preventing the spread of infection already existing among Canadian herds and flocks.

The nature of the duties performed by the officers of this branch is very frequently such as to provoke adverse criticism from those members of the general stock-owning and especially stock-dealing public, who, from want of thought or of experience regarding the disastrous effects of uncontrolled animal plagues, are inclined to look upon veterinary inspection with an unfriendly eye. It is therefore a source of gratification to find that the efforts of my officers in this direction are becoming more appreciated and understood, and that the work of controlling contagious diseases by the necessary compulsory methods is now being accepted by the stockmen as national and wise.

The statistics for the year 1916-17, which will be found in the special report of the Veterinary Director-General, indicate that the policies of my department are sound and practical, and effective in controlling contagious diseases of animals.

## GLANDERS.

The very dangerous and highly infectious disease of horses, mules, and asses, known as glanders, has been practically eradicated from the greater portion of the



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Dominion. During the last few years the most serious outbreaks have occurred in limited areas in the provinces of Alberta and Saskatchewan.

The success which has followed the slaughter of all the horses reacting to mallein, and the payment of compensation therefor, would indicate that it will also be possible to clear up the infected centres in the provinces in which it now exists. There is no doubt, however, that the department will be confronted in the future with new outbreaks throughout this country, as even the most careful measures will not absolutely prevent the importation of infection through some unobserved source.

There were approximately 224 horses destroyed for this disease during the past year, for which \$21,928 will be paid in compensation, this being a slight reduction over the amount paid in compensation last year.

The mallein which is used by the inspectors of this branch for diagnostic purposes is all manufactured at the Biological Laboratory here, and during the past year over 14,000 doses were distributed to our officers.

The same policy has been enforced in dealing with this disease since 1905, and consists in quarantining suspected animals until they have been shown to be free from the disease by the mallein test. All reacting horses are destroyed and, after the lapse of a suitable period, the contact horses are again tested, and if no reactions are obtained the quarantine restrictions are promptly removed.

The same precautionary measures are taken with regard to the importation of horses from other countries. Those coming from the United States, if not accompanied by a satisfactory mallein test chart, signed or endorsed by an officer of the Bureau of Animal Industry, are held at the boundary port and tested there by one of my officers. Those arriving from Great Britain must be accompanied by a certificate signed by an officer of the Board of Agriculture and Fisheries, stating that no contagious disease of horses has existed in the district from which the horses came.

Horses accompanied by these certificates are not tested but are allowed entry after a careful inspection is made. This procedure has been found to be quite satisfactory, owing to the fact that these importations are almost entirely limited to valuable pure-bred stock, in which the disease is seldom seen.

#### DOURINE.

Excellent progress has been made in controlling this disease, which is largely due to the serum method of diagnosis.

Very great difficulty was experienced for many years in dealing with this insidious malady, owing to the impossibility of recognizing it until the infection had been widely spread. Affected animals do not always manifest symptoms, but they are just as capable of transmitting the disease. It was therefore necessary, before the serum method was discovered to keep animals under restriction for very long periods, during which breeding was not permitted. This entailed serious financial losses to the horse owners, especially so as this disease was first discovered on the range in one of the best horse-raising districts in Alberta.

Owing to the seriousness of the situation, the department decided to secure land for experimental purposes in the infected area, on which was established a research



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laboratory. Dr. Watson, whose experience at the Biological Laboratory, Ottawa, specially fitted him for this work, was placed in charge, and after several years was able to perfect a method of serum diagnosis, which has proved to be of the very greatest benefit, as by this means the disease can be diagnosed in affected animals, although they may show no symptoms and appear in perfect health. There have been approximately 5,000 blood tests made, with only forty-eight positive results. The diseased animals have been slaughtered, and \$3,900 will be paid in compensation.

With the exception of one case, all of these animals were found in the old infected districts in the province of Alberta. The disease has therefore been practically eradicated in Saskatchewan, where a few years ago it gave considerable concern. There is now every reason to believe that the officers of this branch will be able to eradicate this disease in this country in the very near future.

## MANGE IN CATTLE AND HORSES.

Mange in cattle and horses has been found to a more limited extent than in previous years. This disease has never been prevalent in horses in this country, and any outbreaks that have occurred among these animals have been quickly controlled. In cattle, however, it has given the department anxiety for many years, as it has existed on the open range in the provinces of Alberta and Saskatchewan.

The disease was so widely spread that it was necessary, before I assumed charge of this department, to enforce general compulsory dipping operations over an extended territory. Sufficient progress was, however, made to change this very troublesome and unpopular procedure to one of individual quaranting of affected and contract herds.

The stockmen readily co-operated in the enforcement of these regulations, as they did not affect those whose herds were free from mange, and which had no history of having been in contact with infection. As, however, the infection is still on the open range, it is even now necessary to restrict the movement of any cattle from a defined area in these two provinces, as otherwise the most careful measures could not prevent the extension of the infected area.

Under the Special Mange Order, cattle cannot be moved out of this area unless they are accompanied by a veterinary inspector's certificate. Each shipment must be inspected by the veterinary inspector, and if the cattle are for any other purpose than immediate slaughter they must first be dipped twice under his supervision.

Good progress has been made, and approximately one hundred townships were removed from the requirements of this order during the past year.

Systematic measures are followed in dealing with this disease and in making careful inspections of all cattle in the mange area. A number of range riders are employed to ride the range and to report their findings to a veterinary inspector, who is given charge of a certain portion of the area. In this way it is possible for my officers to keep in close touch with the existing conditions throughout the centre territory covered by the order.

There were 1,450 animals found actually affected with this disease during the past year, and while the decrease in the number of active cases over the previous year is small, the infected area is yearly becoming more limited, and will enable the officers of this branch to concentrate their efforts with better results.



## SHEEP SCAB.

Sheep scab has not been dealt with during the past year in any part of Canada, with the exception of Manitoba. In this province it still exists to a slight extent, fifty-four (54) cases having been detected in an infected district.

A thorough inspection has been made of all suspected flocks, and all diseased and contact sheep are being systematically dipped. All possible measures are being taken to eradicate this outbreak at the earliest possible date.

In view of the importance of keeping our flocks free from this disease, special measures are enforced for the protection of Canadian sheep from the introduction of infection from outside. Sheep from the United States imported for any other purpose than immediate slaughter must either be accompanied by a satisfactory dipping certificate, signed by a Bureau officer, or be held at the boundary for thirty days, during which period any action which may be considered desirable can be taken with regard to them.

## ANTHRAX.

This disease is fortunately not at all prevalent in this country, and in the last five years it has only been detected in the provinces of Ontario and Quebec, where it has caused thirty-seven fatalities.

In view, however, of the many opportunities of introducing infection in fodders, grains, and hides, as well as in other indirect ways, from foreign countries, in which the disease is prevalent, it is fortunate that there has not been a larger number of cases.

My department supplies anthrax vaccine for immunizing purposes at cost. This is manufactured at the Biological Laboratory in Ottawa, and is forwarded to veterinary practitioners only after the premises on which the disease has been found have been quarantined and a veterinary inspector has supervised the proper disposal of the carcasses of animals dying from this disease, as well as all contact matter.

It is not considered wise to allow the veterinary inspectors to immunize the contact animals, and the owners must, therefore, give the department the name of the veterinarian whom they decide to employ to do this work, before the vaccine is forwarded.

## RABIES.

There were approximately only nine animals found affected with this disease during the past fiscal period. It is very fortunate indeed that this troublesome malady, which is transmitted by the bites of rapid animals, chiefly the dog, and which is most important from a public health standpoint, has only been detected in a few areas in Ontario. While the fullest investigation did not result in determining the exact origin of the infection, the information obtained would indicate that the disease was introduced from New York state.

In view of the limited number of cases detected in this country during the past year, it has not been necessary to enforce a muzzling order, as the individual cases were dealt with by ordinary quarantine measures.



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## TUBERCULOSIS.

The suppression of bovine tuberculosis by reasonable practical measures has received very careful consideration for many years, but, with the exception of the Tuberculosis Order for dairy cattle, I have not so far been able to justify the changing of the old policy of the department.

Tuberculin is still manufactured at the Biological Laboratory in Ottawa and supplied upon the request of cattle owners to veterinarians, provided the owners agree to have all reacting cattle promptly earmarked. The veterinarian must report the result of the test on charts specially prepared for this purpose.

The department also assumes charge of herds for the eradication of this disease, and makes systematic tests free of charge. All reacting animals are earmarked, after which the owner can dispose of them under official supervision in any way he may see fit. Before the department takes action in these cases the owner must give his assurance that he will follow the advice of the inspectors of the department.

The inspectors also test pure-bred cattle for shipment to the United States, as well as those consigned to points in the province of British Columbia.

The Tuberculosis Order, which was passed in 1914, and which provides for departmental assistance to municipalities which decide to provide milk for their citizens from tuberculin-tested healthy cattle, has been satisfactorily enforced in Saskatoon. Unfortunately, however, other municipalities have not seen fit to take advantage of this order, owing to the fact that they were unable to license all dairies from which milk was obtained. In some cases, milk was imported from the United States, while in other cases the provincial legislation did not give the municipality power to pass by-laws which would make the tuberculin test compulsory.

The city of Regina came under the order, and the work of testing was well under way when the municipality discovered that certain provincial requirements made it impossible to comply with the requirements of the order. This work was therefore discontinued in this district.

I am quite satisfied, however, from the experience which has been gained in the enforcement of this order in Saskatoon that its enforcement will be of material benefit to any community, and will also, if taken advantage of in a general way, prove of value in the eradication of bovine tuberculosis.

The reduction in the number of reactors discovered during this year, compared with those found during the previous one, undoubtedly supports this view. There were approximately 160 reacting cattle out of 2,937 tests during 1915-16, and 39 out of 2,612 tests during the last fiscal period.

The total amount of compensation paid in 1915-16 was \$3,144.57, and last year \$541.65. The owners, however, realized, in addition, \$928.24 in salvage for the carcasses, which were passed during the last year and \$3,824 during the previous year.

As many municipalities were unable to observe certain requirements, I am, upon the advice of Dr. Torrance, considering asking Council to amend the order in such a way as to make it more practicable. It is my intention to have this order apply to any municipality, provided it is able to employ a paid sanitary inspector for its satisfactory enforcement, instead of limiting it to municipalities of not less than 5,000 inhabitants.



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It is also my intention to have the dairies classified as raw-milk dairies and pasteurized-milk dairies. In the former case it will be compulsory for all cattle to be tested with tuberculin, and in the latter case the test will not be enforced, but the milk will be scientifically pasteurized under proper supervision.

#### HOG CHOLERA.

A compulsory slaughter and compensation policy has been followed in dealing with this disease for many years, with satisfactory results. There has been a material reduction in the number of outbreaks of this disease during the last year. It has only been prevalent in the provinces of Ontario and Quebec; only a few small outbreaks having occurred in British Columbia, Alberta, and Nova Scotia; in Manitoba one isolated outbreak was dealt with, and in Saskatchewan the disease has not been observed.

It is a difficult matter to trace the origin of these outbreaks, but from the facts which have been ascertained there is no doubt that the infection is maintained in this country very largely through the feeding of scraps of United States pork.

The occurrence of the Manitoba outbreaks was of interest in that it occurred on premises where the hogs are being fed on garbage, and at a time when the garbage was being fed in a raw state.

Special measures were put into force a few years ago, with a view to controlling the feeding of garbage to hogs. A policy of insisting upon garbage feeders being licensed has been followed, and in all cases where these licenses are issued the owners must have proper facilities for cooking the garbage, and must also have suitable accommodation for the number of hogs fed, which must be kept in a sanitary condition.

Although this material is not considered to be a suitable food for hogs, owing to the fact that by the time it is fed it is frequently in a sour and fermented state, it is nevertheless questionable whether or not it would be practicable or desirable to absolutely prohibit its use for food purposes. The department is therefore taking reasonable measures in restricting its use and endeavouring to educate the hog owner to feed this material in a fresh but thoroughly cooked state, and also in the keeping of his premises in a clean and sanitary state.

The inauguration, two years ago, of the system of inspecting and licensing premises where hogs are fed on garbage, together with the enforcement of the regulations with regard to the proper cooking of this material, has no doubt been an important factor in preventing outbreaks of hog cholera.

Although the department still slaughters all hogs showing evidences of being affected with this disease, it does not in all cases follow the old policy of slaughtering all contact hogs which do not show symptoms of illness. The procedure started last year has been followed again this year, with satisfactory results.

Contact hogs giving normal temperatures are injected with hog cholera serum. The premises on which they are kept are strictly quarantined and disinfected, and the owner is allowed to fatten the serum-treated hogs for the block.



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In view of the danger of disseminating the hog cholera virus from plants where manufactured, these products are not permitted to be made in this country. The serum used by the department is procured from a reliable firm in the United States, and is used only by the officers of this branch.

The importation of hogs from the United States into this country is also prohibited, unless an affidavit accompanies each shipment, stating that the hogs comprising the shipment have not been immunized against this disease.

The United States authorities have suspected for years that the use of hog cholera virus as an immunizing agent has, through carelessness, caused very many outbreaks of hog cholera throughout that country. This department, therefore, considered it wise to restrict the use of serum to its own officials.

It has been estimated that a material saving has resulted to the department, as well as to the hog owners, through the use of this serum. The department has treated with serum approximately 8,500 hogs. Under the old system the majority of these hogs would have been slaughtered as contacts, and an approximate compensation, amounting to \$57,000, paid therefor. These hogs, however, have been treated, fed and slaughtered for pork.

The cost of the treatment of these hogs amounted to \$1,600. The saving to the department alone has, therefore, been approximately \$55,400. In addition to this saving the farmer realized the market value for his pork, as the treated hogs were, with very few exceptions, free from disease, and were therefore utilized as a food product instead of being wasted.

During the past fiscal year, 4,623 hogs have been slaughtered for this disease and \$30,449.32 compensation paid therefor.

## FOXES.

Owing to the great value of the fox industry on Prince Edward Island, I have thought it advisable to continue quarantining all foxes landed on this island until it can be ascertained positively that they are free from disease. These animals are quarantined at Charlottetown for thirty days on a site provided by the provincial authorities, where they are examined and kept under the supervision of a veterinary officer.

Thirty-five (35) imported foxes were quarantined during the last fiscal period, all of which were found to be healthy.

## LABORATORIES.

The work in the laboratories at Ottawa, Lethbridge, Alta., and Agassiz, B.C., has been of very great value to the livestock interests throughout the country. The many biological products manufactured at Ottawa for diagnostic and immunizing purposes have been of inestimable value in eradicating and controlling outbreaks of contagious disease.

There have also been many thousand specimens examined microscopically at these laboratories for the purpose of ascertaining the cause of fatalities.



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In view of the importance of ascertaining facts with regard to contagious abortion, and of determining some practical method for the control and eradication of this disease, one of the pathologists at the Ottawa laboratory is devoting his attention specially to it. An immunizing vaccine has already been made, but our work in connection with it has not advanced sufficiently to attempt its general use. I am in hopes, however, that the vaccine may eventually prove to be the agent needed for the eradication of this very serious malady. Another of the pathologists at this laboratory is devoting his whole time to investigating the diseases of poultry.

The work in the laboratories in the West consists principally of the investigation of diseases peculiar to the provinces in which the laboratories are maintained.

A great deal of the time of the pathologists at the Lethbridge laboratory is devoted to the examination of blood taken from suspected cases of dourine and forwarded by the officers in the field.

The pathologist at Agassiz is engaged in investigating the life-history of certain parasites, with a view to determining to what extent they may carry infection of contagious diseases. He has also undertaken some interesting experimental work with regard to fern poisoning, and has definitely determined that a species of fern growing in certain localities in British Columbia actually contains an alkaloid, which is poisonous to horses.

In addition to those lines the pathologists at these laboratories examine, microscopically, specimens of diseased tissues forwarded from the abattoirs under federal inspection, with a view to deciding what official action should be taken in doubtful cases.

Systematic measures are taken for the constant disinfection of stock cars, chutes, and yards, as there is probably no other more certain means of disseminating the infection of contagious diseases than by permitting the use of unsanitary cars, chutes, or yards. There are approximately twenty-five (25) inspectors, who devote all of their time to this work; with the exception of four travelling inspectors they are located at suitable points where cleaning and disinfecting facilities exist.

In order to ensure that all cars are regularly disinfected, an order is in force which provides that all empty stock cars arriving at or passing through any of the places mentioned below, shall, unless bearing evidence of having previously been so treated, be cleansed and disinfected under the supervision of an inspector before being allowed to proceed:—Halifax, N.S.; St. John, N.B.; Montreal, Point Levis, Quebec, Que.; Chatham, Toronto, Ont.; Winnipeg, St. Boniface, Man.; Moosejaw, Sask.; Medicine Hat, Lethbridge, Calgary, Edmonton and Strathcona, Alta.; Cranbrook, Kamloops, Nelson, Port Mann, Revelstoke and Vancouver, B.C.

In order that this work shall be effective, it is very essential to ascertain the true disinfecting properties of materials used. The railway companies are required to forward to the laboratory here samples of disinfectants which they intend to purchase for the disinfection of their cars and yards. These samples are carefully examined by the pathologist and their phenol coefficient definitely ascertained. If they are found to be satisfactory the railway companies are promptly notified and the use of the disinfectant allowed; if not satisfactory, the department does not, under any circumstances, permit the preparation to be used.



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## QUARANTINES.

The quarantine stations on the Atlantic and Pacific seaboards, as well as along the international boundary, are being maintained in a good sanitary and serviceable state, as it is most important that animals presented for entry can be safely detained and kept under official supervision in comfortable quarters.

Special measures have been taken to make the Levis quarantine station modern in every respect. This is the largest and most important of our quarantine stations, and the one through which the most valuable importations from overseas enter. The buildings have been erected on the site which was purchased a few years ago, and are located in such a manner as to permit each individual shipment to be kept quite separate while in the stables and also while out at pasture.

It was found advisable to change the inspection port at Bridesville, B.C., to a quarantine station, and to establish inspection ports at Sprague, Man., and Centreville, N.B. The latter point was made an inspection port in place of Florenceville, owing to the fact that it was closer to the international boundary and in a more suitable position.

## MEAT AND CANNED FOODS DIVISION.

The work of this division continues to increase, and its growth has been especially marked during the past year. This at first sight might appear to be a somewhat strange statement in view of the many reports of the shortage of meat-producing animals. The statistics, however, show that there were slaughtered at establishments operating under the Meat and Canned Foods Act, approximately 648,859 cattle, 2,245,515 swine, and 416,575 sheep. With the slaughter must also be considered the extraordinary imports made by the managements of the inspected plants. These amounted in port alone to 1,032,719 carcasses, besides cuts of pork which in weight would equal another 200,000 carcasses.

The tremendous demands for meat foods to feed the armies of the Allies has drawn very heavily upon the supply in Canada; in fact, to carry out their contracts, Canadian packers were compelled, as above stated, to draw on the United States for nearly one-third of the pork handled.

The prices paid to farmers have been the highest on record, and while the prices of grain and feedstuffs have been high there appears to have been a reasonable margin of profit left to the feeder. I trust, therefore, that the producers of Canada, upon whom so much depends at this time, will redouble their efforts in order that a steady supply of meat foods may be available both for export and home consumption.

Time and space will not permit me to explain in detail the work carried on under the Act, which applies only to establishments engaged in export trade (either foreign or interprovincial) in meats or meat food products, fish, fruit or vegetables.

The inspection of meats and their products is most rigid and thorough, and the work is performed by two classes of inspectors, veterinary and lay.

The veterinary inspectors must first be graduates of a recognized veterinary college, and must pass a further examination prescribed by the Act before they can be appointed. They serve a probationary period during which they are instructed



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regarding their duties, and their work is supervised by one of our older officers. If at the end of this time they have shown their fitness for the position, they become attached to the staff; if not, their services are dispensed with.

The veterinarians' duties begin with the arrival of the animals at the plant, when a careful examination is made and those showing suspicious symptoms are separated, tagged, and slaughtered at some specified time when they are given special examination. All animals at the time of slaughter are very carefully examined, and those showing disease or abnormal conditions are dealt with as required by the regulations or as the judgment of the inspector demands.

The lay inspectors also are required to pass a qualifying examination and to serve a probationary period before they become permanent employees. Their duties are confined to the maintenance of the general sanitary conditions of the plant, the equipment, the handling of the products, and also the marking of shipments leaving the establishment.

Edible meats or meat food products which leave an establishment under inspection must be marked with the inspection legend, which consists of the words "Canada Approved," the crown and the establishment number. Indelible products must be plainly and distinctly marked "Indelible, unfit for food." Every operation in these establishments is under the direct supervision and control of my officers during the whole time that work is being done.

There are at present thirty-nine establishments under inspection, at which one hundred and twenty-seven veterinary and sixty-seven lay inspectors are stationed.

#### FRUIT AND VEGETABLES.

The inspection carried on in connection with establishments engaged in the manufacture of canned, preserved, and evaporated fruits and vegetables is confined principally to sanitary conditions. My officers visit at such times as it is deemed necessary and advisable, examine closely the entire plant, leave a written statement as to the conditions found, and issue instructions as to needed improvements. A reasonable time is given to comply with their demands. If these are not met the plants are forbidden to operate. Careful examination is also made of all raw as well as of all finished products, and any that are found unwholesome or unfit for food are destroyed. As, however, they are not during the whole time of preparation under our supervision, no special mark is authorized to be placed upon fruit or vegetable products to show that they have been manufactured under the provisions of the Act.

During the past four years samples have been taken of every fruit and vegetable canned in Canada. These have been very carefully examined, and much valuable information secured which has been recorded and which will assist materially in the promulgation of standards of quality, a matter at the present time receiving very serious consideration. Such standards, if indicated upon the label, would enable the purchaser to be reasonably sure of the quality of the contents of the tin.

The very unfavourable weather during the past season reduced the pack to such an extent that extremely high prices prevailed.



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## CONDENSED AND EVAPORATED MILK.

This industry is growing rapidly, and has given us very little trouble. Nearly all the plants are models of construction and sanitation.

During the year sediment tests have been made from the milk furnished by each individual supplying the plants. These tests show the condition of the raw milk in nearly all cases to be very satisfactory.

From present indications my officers engaged in this work under the Act will have an extremely busy year, as the demand for the class of foods coming under their supervision is enormous.

## FRUIT BRANCH.

The commissioner spent some time in the early part of the summer visiting the various fruit-producing districts of Canada, in order to keep in touch with conditions and with the marketing methods adopted in each section. A visit was also made to the state of Washington in order to form some estimate of the probable crop there, as the fruit from this state, together with that from other western states, seriously competes with Canadian apples in many of our markets.

Special efforts were made to bring producers in closer touch with the wholesale trade, and to create a spirit of co-operation that would result in more satisfactory methods of marketing.

The co-operation of the various railroads operating in Canada was obtained to give some publicity to Canadian fruit in their dining cars and hotels, and doubtless home consumption was increased by that means. No extensive advertising campaign was carried on.

## THE FRUIT SEASON.

The apple season of 1916 was one of the most unfavourable in the history of the industry. The spring was very wet in all sections of the Dominion except the Maritime Provinces, and growers were unable to get on to the land for spraying, cultivating, etc. In many instances, orchards did not receive proper attention, and the development of apple scab was consequently very serious and rapid.

In Ontario, the apple crop was so poor in quality that less than 10 per cent was graded No. 1, and the total crop was only about 75 per cent of that harvested the previous year. In fact, the crop was undoubtedly the lightest and poorest in quality produced in many years.

The Nova Scotia crop was about 680 barrels, or slightly more than that harvested in 1915, and of very good quality. Of the total crop, 415,000 barrels were exported, 200,000 barrels marketed in Canada, and 65,000 barrels used in evaporators and canning factories, etc.

In British Columbia the crop was slightly more than the previous year but there was a smaller percentage of No. 1 grade. The province exported to Australia and New Zealand, 70,000 boxes of apples, as compared with 31,000 boxes in 1913, 41,000 in 1914, and 55,000 in 1915.



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Peaches were about 75 per cent of a normal crop in Ontario, and practically a full crop in British Columbia. Plums and pears were a light crop in all sections, except in parts of British Columbia, where the pear crop was about 25 per cent larger than in 1915.

Grapes were less than a normal crop.

#### FRUIT CROP REPORTS.

As in 1915, monthly fruit crop reports were published on the first of each month from June to October, inclusive. These reports dealt with all varieties of fruit in every section of Canada and in many parts of the United States as well.

The publication of telegraphic reports was also continued. Every effort was made to secure information by telegram from reliable authorities in the producing districts of Canada and the United States, and from our fruit inspectors in the large markets. Cables were also received twice a week from Mr. J. Forsyth Smith, Canadian Fruit Trade Commissioner, giving the sale price of all varieties of Canadian and American apples in Great Britain.

These telegraphic reports were published twice weekly from August 15 to April 15. They have proven to be a valuable source of information to the public, and our mailing list is rapidly increasing as their value becomes known.

#### INSPECTION WORK.

For the purposes of inspection under part IX of the Inspection and Sale Act, the country was divided in 1912 into five districts, with a chief inspector in charge of each. This system has proved satisfactory and has been continued from year to year. The districts are:—

1. Maritime Provinces,
2. Eastern Ontario and Quebec,
3. Western Ontario,
4. Manitoba, Saskatchewan and Alberta,
5. British Columbia,

In district 1 the number of inspectors was the same as last season, that is two permanent and fourteen temporary inspectors. All these men with the exception of one permanent inspector for New Brunswick and two temporary men detailed for duty on the docks at Halifax, were located in the producing district of Nova Scotia. The system of inspection at point of shipment, inaugurated in the Annapolis valley in 1914, has been continued and has been heartily endorsed by all the leading growers and dealers of the province. Nova Scotia had a crop somewhat below the average of the past seven or eight years, but of fair quality and our inspectors, moving about the packing houses, were able to do much to raise the standard of the packing and grading, and the fruit exported from Nova Scotia during the season was honestly packed and brought high prices on the British markets.



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In Quebec, while the crop as a whole was of poor quality, many well-cared-for orchards gave crops not excelled in any other part of the Dominion. Although commercial fruit growing has not of late years received the same attention here that it has in other sections of Canada, varieties of the McIntosh and Fameuse type are produced to a high state of perfection and there appear to be signs of a revival of interest in orcharding just at present. During the past season, therefore, when the exports from Montreal were exceedingly light, only some 68,000 barrels being shipped from that port, it was possible to locate our inspectors in the growing districts, where they were able to do excellent work, not only by assisting the growers towards a higher standard of grading and packing, but by enthusing them to give the proper attention to their orchards.

In eastern Ontario, as everywhere in this province, the apple crop was short and of exceedingly poor quality except in the few commercial orchards that had received particularly good care. Both here and in western Ontario the value of inspection at point of shipment was clearly demonstrated. With a short crop of poor quality, making the output of high-class fruit low and prices correspondingly high, the temptation was great to run as much fruit as possible into the No. 1 and No. 2 grades, notwithstanding the standards laid down in the Inspection and Sale Act. The constant presence of our inspectors, in the orchards and packing houses, where they were able to give practical demonstrations of the proper methods of grading and packing, had such a restraining influence that the growers and shippers, instead of lowering the quality of the higher grades, packed an unusually high percentage of the crop in the No. 3 grade, thus keeping the No. 1 and No. 2 fruit remarkably true to grade.

In pursuance of the policy of inspection at point of shipment, three of the temporary inspectors, who in former years were stationed in the marketing centres in the Prairie Provinces, were this year detailed for work in the producing districts of Ontario. In district 4 (the Prairie Provinces) there were, consequently, only eight inspectors, where last season we had eleven. I feel confident though that the additional work done in the producing districts more than offset the fact that somewhat fewer inspections were made in the marketing centres of the West. The inspection on the prairies is largely a matter of checking up the work done at the shipping points, and of catching lots which it has been impossible for the district inspector to examine. The inspection of imported fruit is also an important feature of the work here, as large quantities of American fruit compete in these markets with our domestic fruit. In the western markets too, our inspectors are able to be of considerable assistance to the growers and shippers in sending exact reports of the condition in which their fruit reaches its destination. In fact, our inspectors' reports have often been the means of effecting an amicable settlement of disputes between buyers and sellers which, in many cases, are caused merely by the misunderstanding that so often arises when business is carried on by persons more than a thousand miles apart, and having no personal knowledge of each other.

In district 5 (British Columbia) the staff consisted during the past year of two permanent and five temporary inspectors, and the inspection work proceeded along much the same as in Eastern Canada. The temporary inspectors, appointed for the active fruit season, being experienced fruit men, have been able to give practical



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assistance in the grading, packing and loading of fruit. This has been particularly valuable during the past couple of years when the fruit-growing districts of the province have been practically denuded of all men of military age who before the war devoted their attention to the production of fruit. In many cases, women have been left alone to harvest the crop, and the inspectors of this department have esteemed it a privilege to assist in this work wherever possible.

The systematic inspection of basket factories, commenced during the season of 1915, was continued during 1916. Owing largely to the representations made to the makers by the inspectors of this department, the quality of the packages has been much improved, and very few complaints were received from growers as to the strength and size of packages supplied to them during the past year.

A complete list of the number of inspections made, the number of packages examined, etc., is hereto appended. It will be noted that in these figures the number of packages of small fruit examined in the season 1916-17 is very much less than the corresponding figures in previous years. This is due to the fact that, up to this year, these figures were given in quarts, whereas this year, and in future years, it is our intention to publish them in packages, without reducing the contents of each package to quarts.

#### PROSECUTIONS.

Violation of the Inspection and Sale Act, part IX, with respect to the false packing and marking of fruit, have been fewer this season than for many years. This was due, in part, no doubt, to the light crop, which gave our inspectors a chance to keep in touch with a much larger percentage of the shipments than usual, but credit must also be given to the system of inspection at point of shipment which has been adopted the last couple of years, the full value of which is just being felt. The educational effect of having the inspectors located at the producing points, so that they have been constantly in touch with the shippers in their orchards and packing houses, has been very marked.

The campaign commenced in 1915, to give adequate inspection to basket fruit, was continued during the past season, and the good result of the work done by our staff of inspectors in the soft fruit district was very apparent. Prosecutions in regard to the over-facing of packages—that is the placing of fine, large, highly coloured specimens on the top layer of a basket, while underneath the fruit was immature, off colour, and small—were only twelve in 1916, in comparison with twenty-one in 1915; and complaints of the under-filling of baskets and berry boxes, which had been common in the past, have almost entirely ceased. The trade recognizes that this is the result of the constant vigilance of our inspectors at the shipping points.

In 1915, too, a vigorous campaign was carried on with respect to imported fruit to see that it was packed and marked in accordance with the requirements of the Inspection and Sale Act. The effect of that campaign and of the twenty-five convictions secured against importers who continued, after warning, to neglect to mark their fruit in conformance with the law, was such that this season there has been practically no complaint in regard to imported fruit, only two convictions being recorded for the whole season.



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## INSPECTION STATISTICS.

The following table gives comparative statements of the number of lots inspected and the number of packages inspected for the seasons 1912-13 to 1916-17, inclusive:—

Variety.		Number of lots in- spected.	Number of packages in lots in- spected.	Number of packages inspected.
1912-13.				
Apples .....	Brls....	18,457	1,321,440	80,102
" .....	Boxes...	2,101	204,971	33,578
" .....	Baskets.	119	16,249	2,719
Crab apples.....	Boxes...	62	12,186	695
" " .....	Baskets.	17	1,395	660
Pears .....	Boxes...	272	36,356	2,202
Peaches.....	" .....	65	25,592	1,557
" .....	Baskets.	121	18,837	2,139
Plums.....	" .....	186	67,751	7,254
Tomatoes.....	" .....	264	39,174	6,949
Small fruits.....	Quarts.	1,187	2,264,559	172,945
Total.....				310,791
1913-14.				
Apples .....	Brls....	11,725	799,510	59,643
" .....	Boxes...	2,631	341,679	29,879
" .....	Baskets.	105	11,908	1,219
Crab apples.....	Boxes...	192	13,250	1,462
Pears.....	" .....	977	48,274	8,559
Peaches.....	" .....	806	35,494	12,657
" .....	Baskets.	353	60,771	7,564
Plums .....	" .....	679	132,159	15,200
Tomatoes .....	" .....	173	59,707	7,305
Small fruits .....	Quarts..	736	1,128,907	95,841
Total.....				239,329
1914-15.				
Apples.....	Brls....	8,926	765,445	59,602
" .....	Boxes...	2,769	457,055	36,118
" .....	Baskets.	191	29,476	3,994
Crab apples.....	Boxes...	38	2,443	951
Pears.....	" .....	894	91,121	9,760
Peaches.....	" .....	735	183,952	10,035
" .....	Baskets.	147	17,797	2,422
Plums.....	" .....	643	180,154	12,294
Tomatoes.....	" .....	305	103,742	12,171
Small fruits.....	Quarts..	1,162	1,529,598	151,599
Grapes.....	Baskets.	244	308,728	22,394
Total.....				321,300
1915-16.				
Apples.....	Brls....	8,882	710,858	60,248
" .....	Boxes...	4,297	758,337	46,791
" .....	Baskets.	204	14,319	1,797
Pears .....	Boxes...	1,062	121,414	8,816
Peaches.....	" .....	1,022	270,508	12,575
" .....	Baskets.	838	106,569	10,796
Plums .....	" .....	998	482,416	22,231
Tomatoes .....	" .....	633	200,343	7,926
Small fruits.....	Quarts..	1,724	2,670,984	275,234
Grapes.....	Baskets.	260	382,332	11,395
Total.....				457,809



INSPECTION STATISTICS.—Continued.

Variety.	Number of lots in- spected.	Number of packages in lots in- spected.	Number of packages inspected.
1916-17.			
Apples . . . . . Brls . . . . .	6,412	404,597	43,359
" . . . . . Boxes . . . . .	2,337	679,148	32,420
" . . . . . Baskets . . . . .	188	14,472	1,332
Pears . . . . . Boxes . . . . .	200	108,426	6,108
Peaches . . . . . " . . . . .	1,179	289,560	15,612
Plums . . . . . Baskets . . . . .	609	158,133	7,215
Tomatoes . . . . . " . . . . .	624	136,993	5,812
Small fruits . . . . . Packages . . . . .	2,039	282,365	99,799
Grapes . . . . . Baskets . . . . .	193	273,435	7,951
Total . . . . .			219,608

MOVEMENT OF APPLES.

During the season (1916-17), 415,908 barrels and 2,703 boxes of Canadian apples were exported from Halifax, and 45,588 barrels and 67,725 boxes from Montreal. The Prairie Provinces received, up to the end of December, 1,076 cars of British Columba apples, 616 cars of Ontario apples, 644 cars of imported apples, and 63 cars of Nova Scotian apples, a total of 2,399 cars. Between January 1 and March 31, 1917, 130 cars of apples were received in Winnipeg.

MEETINGS.

In addition to their other duties, the fruit inspectors have assisted at numerous meetings during the year in various parts of the Dominion, and in many cases have acted as judges of fruit at local fairs and exhibitions. Members of the staff have also been invited to attend and address meetings of fruit growers in the states of New Hampshire, Virginia, and New York.

The packing expert of the department has done good work during the year, having conducted short courses in packing in Ontario, Nova Scotia, and New Brunswick. The box-packing end of his work is particularly important at the present time, inasmuch as our eastern growers have not been accustomed to putting their apples up in boxes, and yet of late years the box has been growing in favour with the consuming public, and if our growers do not have an opportunity of becoming expert in this work, there is a grave danger of the market being captured by imported fruit. In British Columbia, while the art of box packing is thoroughly understood by the experienced packers, much good work has been done by our inspectors in teaching the young, inexperienced packers who have, to a great extent, had to look after this work since the beginning of the war. In addition to the general work along this line carried on throughout the active fruit season, during the past winter one of our permanent inspectors, an expert box packer, has conducted special packing courses at various points throughout British Columbia, all the arrangements for these courses being made by the Provincial Department of Agriculture.



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## PRICES.

Owing to the shortness of the fruit crop, the prices received by the growers were generally higher than those of 1915. Strawberries and raspberries showed an advance of perhaps 15 per cent. The scarcity of labour, however, seriously interfered with the picking of these crops, and in some parts of Ontario considerable quantities of raspberries and currants were not harvested. Peaches, plums, and cherries were in good demand. The average wholesale price of peaches and plums on the Toronto and Montreal markets were:—

Peaches,	45 cents and 35 cents per 11 and 6-quart basket
Plums	45 cents and 30 cent      “      “      “

In spite of the information sent out from this department, through our crop and market reports, fruit growers did not realize the shortness of the apple crop, and, while prices for the ordinary commercial varieties averaged to the grower about \$3.50 for No. 1's, \$3 for No. 2's, and \$2 for No. 3's, f.o.b. shipping point, it was found that when these were collected by the various dealers, the supply was much shorter than had been anticipated, with the result that the dealers forced the price up to the retail merchants, and prices ranged from \$5 to \$8 per barrel for No. 1 grade, according to variety, the higher figures being for McIntosh, Fameuse, and Spy. The chief factor, however, in the high price of apples to the Canadian consumer was the tremendous demand for this fruit in Great Britain. The apple crop of England was practically a failure, and there was keen competition for Canadian shipments on arrival in those markets. The highest prices we have ever known on a commercial scale were realized, the highest paid being for some Virginia Albemarle Pippins which sold at from \$17 to \$19 per barrel, and the average on the British markets for No. 1 barreled stock of the following Canadian standard varieties being as follows:—

*Nova Scotia Fruit.*

King.. . . . .	\$7 50	Golden Russet.. . . . .	\$9 25
Blenheim.. . . . .	6 50	Stark.. . . . .	6 50
Ribston.. . . . .	6 25	Northern Spy.. . . . .	7 75
Greening.. . . . .	6 50	Ben Davis .. . . . .	8 00
Baldwin.. . . . .	7 00	.	.

*Ontario Fruit.*

Wealthy.. . . . .	\$ 9 50	Snow... . . . .	\$11 00
Alexander .. . . . .	7 00	Baldwin.. . . . .	9 50
McIntosh Red.. . . . .	11 00	Ben Davis .. . . . .	8 25
King.. . . . .	10 25	Golden Russet.. . . . .	9 25
Greening.. . . . .	9 00	Stark.. . . . .	9 00
Cranberry .. . . . .	9 50	Northern Spy .. . . . .	8 75

NOTE.—The Nova Scotian barrel is slightly smaller than the Ontario barrel.

The natural result of these high prices was that practically all the fruit that was available, and for which space could be secured, went forward, resulting in a serious shortage of good fruit in Canada and very high prices being demanded for all that was offered for sale.

## APPLE EMBARGO.

On February 24, 1917, a proclamation was issued in Great Britain prohibiting the importation of fruit into Great Britain, except under license. Representations were made to the British Government on behalf of the fruit interests of this country



and the dealers of Great Britain, with the result that the embargo was raised, until the 31st of July, 1917, to allow the fruit of the Dominions to enter the United Kingdom to the extent of 50 per cent of the imports of 1916. After July 31 the prohibition becomes absolute, unless the conditions necessitating the embargo have changed. The lifting of the embargo was a great relief to many Canadian shippers, who had held apples for shipment to the markets of Great Britain and who would consequently have suffered great loss had they been obliged to divert the fruit to other markets. The Canadian apples were also eagerly sought by the consumers of the United Kingdom.

### ENTOMOLOGICAL BRANCH.

The work of this branch has comprised the administration of the Insects and Pests regulations of the Destructive Insect and Pest Act; the suppression of the brown-tail moth in Nova Scotia and New Brunswick and the introduction of its parasitic and predacious insect enemies and those of the gypsy moth into Eastern Canada; the conducting of investigations upon insects affecting farm, garden and orchard crops, forest and shade trees, domestic and other animals, household and public health, mills and stored products, and the giving of advice concerning the control of such insects; the naming of collections of insects for institutions and individuals; and the administration of an appropriation for the care of the orchards in the Indian reservations in British Columbia. In addition, the Dominion Entomologist has been called upon to advise on questions relating to the protection and encouragement of birds and on the conservation of wild life generally.

Under the Destructive Insect and Pest Act, nursery stock originating in countries in which the San José scale occurs was fumigated at our various fumigation stations. In addition nursery stock originating in Europe, Japan and the New England States was inspected either at the ports of entry for nursery stock or on the premises of the importers for the gypsy and brown-tail moths and other foreign insect pests that such imported trees and plants are likely to introduce into the country. Owing to the continued disturbed conditions in Europe, particularly in Belgium, Holland, and France, from which the greater part of the foreign nursery stock is imported, a continued decrease in the amount of nursery stock occurred; but in spite of all these changed conditions and the difficulties experienced in securing ocean transportation, it was possible to obtain a fairly large quantity of these foreign supplies upon which our nurserymen and florists are to a large extent dependent.

The brown-tail moth situation in Nova Scotia and New Brunswick can still be regarded as being in a satisfactory condition owing to the careful scouting and destruction of the winter-webs of the insects in these two provinces. In Nova Scotia, 14,755 winter-webs were collected during the winter of 1915-16, as compared with 18,154 winter-webs collected during the winter 1914-15, and in New Brunswick, where the infested territory is more extensive, 395 winter-webs were collected in 1915-16, as compared with 239 winter-webs collected during the previous season of 1914-15. Every effort is being made to prevent this dangerous insect pest of our fruit and shade trees from firmly establishing itself in New Brunswick, and from increasing in serious numbers and spreading in Nova Scotia. I am pleased to have the opportunity of



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acknowledging the continued co-operation of the provincial governments, who employ half the number of men engaged on this work under the direction of my officers.

We are fortunately still able to record the fact that the gipsy moth, whose depredations are more serious in their effect than those of brown-tail moth, has not yet reached Canadian territory, although its arrival on account of its northeasterly spread in Maine may be expected any year, especially as it has now been demonstrated that the young caterpillars of the gipsy moth can be carried many miles by the prevailing winds.

With a view to being more prepared for the arrival of the gipsy moth, which is only a matter of time, and to assist in securing the natural control of the brown-tail moth, we have continued to import the natural parasitic and predacious enemies of these pests from the New England states, which work has been rendered possible through the continued co-operation of the United States Department of Agriculture, which is gratefully acknowledged. The parasitic and predacious insects were collected by my officers in Massachusetts, and the parasites were reared at the gipsy moth laboratory, Melrose Highlands, Mass., where we were afforded laboratory facilities: From this point these useful insects were shipped to our Entomologist Laboratory at Fredericton, and a distribution of the insects made from the laboratory to various strategical points in the provinces of Nova Scotia, New Brunswick, Quebec, and Ontario. Up to date nearly 100,000 parasites and 4,200 predacious beetles have been imported and liberated.

The investigation of insect pests and their control is now mainly carried on at the entomological field laboratories that have been established throughout Canada during the last five years. The following is a brief summary of the various lines of inquiry that have been undertaken during the last year by my officers in charge of these laboratories under the direction of the Dominion Entomologist:—

*Annapolis Royal, N.S.*—Investigations on the brown-tail moth, the introduction of its parasites and control work. The control of insects affecting orchard crops, including extensive experiments on the comparative value of different insecticides. In this work we have demonstrated the value of arsenate of lime as a substitute for arsenate of lead, both from the point of view of lower cost and superior mixing power. Our experimental and demonstration work in orchard spraying has resulted in a very great increase in the practice of spraying in the province, with a consequent increase in the amount and quality of the fruit.

*Fredericton, N.B.*—In addition to the control work and investigations on the brown-tail moth in New Brunswick, my officers at this laboratory have had charge of the introduction and establishment of the parasitic and predacious enemies of the brown-tail and gipsy moths. Important investigations on the means by which the natural control of the tent caterpillars, the spruce budworm, and the fall webworm is effected were continued with important results, as comparatively little is known concerning the factors affecting the increase and decrease of these insects that from time to time are responsible for widespread depredations in Canada.

*Hemmingford, Que.*—Investigations and demonstration work on the control of orchard insects in a region where little attempt is made to control orchard insects were



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continued with beneficial results. In addition to educational work, a beginning was made of a study of a control of the wharble fly which is widely prevalent in the dairy-ing sections of this region.

*Vineland Ont.*—An investigation of the aphids affecting apple, and their control was continued and satisfactory progress was made. In co-operation with the Provincial Entomologist of Ontario the possibility of controlling the apple maggot by means of arsenical sprays was demonstrated. Investigations on insects occurring in greenhouses, and the more important insects affecting bush fruits in the Niagara fruit district were also continued.

*Strathroy, Ont.*—The investigations on white grub, which are so widely destructive to field crops, was continued. Valuable data were secured.

*Treesbank, Man.*—The main lines of investigation at this laboratory were: the continuation of the study of the local species of white grubs, the life-histories and distribution of the various species of grass stem-maggots and other insects affecting cereals.

*Lethbridge, Alta.*—The investigations on cutworms, and particularly the army cutworm, were concluded during the early summer and the results of these valuable investigations were published during the year.

*Agassiz, B.C., and Royal Oak, B.C.*—At the Entomological Laboratory at Agassiz, and also at a temporary laboratory at Royal Oak, investigations on fruit insects were carried on with conspicuous success. At Royal Oak the life-history and control of the newly discovered orchard pest, the pear thrip, were studied, and the methods of control by spraying was demonstrated to the great benefit of the fruit-growers in the infested region. In the Okanagan valley a beginning was made of a study of the codling moth under British Columbia conditions.

*Vancouver, B.C.*—Further investigations on insects affecting the forest trees of the province were made from this laboratory, and special attention was paid to a serious borer affecting the cedar along the coast. The survey of insects affecting the coniferous forests of the interior of the province was also continued, but the state of the lumbering industry prevented the carrying out of certain lines of control work that otherwise would have been conducted.

It is gratifying to note the increased value of these regional laboratories to the agriculturists whom they are intended to help. The advice and assistance of the officers in charge of the laboratories is in constant demand, and their work is proving to be of great value in rendering timely assistance.

At Ottawa, investigations on white grubs were commenced and experiments on the control of root maggots were continued. A new species of moth was received from Newfoundland, where it was destructive to cabbages. Certain species of greenhouse pests were studied, including the Florida fern caterpillar, which had not been recorded previously in Canada.

The investigations on forest insect depredations in British Columbia have been continued, and more attention was given during the past year to insects affecting the



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forests and lumber industry in Eastern Canada. Special attention was paid to the control of borers in logs, which insects cause serious losses annually, and effective methods of preventing these losses were found. The study of several important species of insects destructive to shade trees in Eastern Canada was undertaken, and good progress was made with the result that it is possible to recommend satisfactory methods of control for the locust borer and alder leaf-miner.

By an arrangement with the Department of Militia and Defence, the Dominion Entomologist visited most of the military camps in Canada last summer, for the purpose of lecturing on the control of insects affecting troops, and advising the sanitary officers in the prevention of flies and lice in the camps. This assistance was greatly appreciated. In addition, a special circular on this subject was prepared for distribution to the officers and non-commissioned officers of the Canadian overseas forces. Further progress in the study of the mosquitoes of Western Canada was made.

Numerous other miscellaneous lines of study have been undertaken on insects affecting the household, stored grain, etc.

A large portion of the time of the Dominion Entomologist has been devoted to questions relating to the conservation of our native birds and mammals. It is gratifying to be able to record the successful conclusion of our efforts to secure better and much-needed protection for our migratory insectivorous birds and wild fowl by the ratification in Washington on December 7, 1916, of the International Convention between Great Britain and the United States for the protection of migratory birds in Canada and the United States. The Dominion Entomologist has also been called upon to advise on the protection of mammals and the treatment of noxious species, and is acting as secretary to the interdepartmental Advisory Board on Wild Life Protection which was appointed in December last.

The following publications have been issued from the Entomological Branch during the year:—

The Cabbage Root Maggott and its Control in Canada, with notes on the Imported Onion Maggott and the Seedcorn Maggott. By Arthur Gibson and R. C. Treherne. Bulletin No. 12, 58 pp., 29 figs., 1916.

The Army Cutworm. By E. H. Strickland. Bulletin No. 13, 31 pp., 15 figs., 1916.

Spraying for Insects affecting Apple Orchards in Nova Scotia. By G. E. Sanders and W. H. Brittain, Entomological Circular No. 8, 11 pp., with spray calendar, 1916.

The Suppression of Two Insects affecting Troops. By C. Gordon Hewitt. Special Circular for Canadian Expeditionary Forces, 8 pp., 2 figs., 1916.

In addition to the above publications the officers of the branch have contributed papers embodying the more technical results of their work to *The Canadian Entomologist* and other scientific journals. Articles have also been contributed each month to *The Agricultural Gazette of Canada*, and in a number of cases reprints of these articles were issued.

During the year considerable additions have been made to the National Collection of Insects, which is now in good order and, with certain exceptions, most of the orders



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of insects have been arranged and correctly named. In addition to the insects collected by my officers, we have received numerous donations from private collectors, and one of my officers, Mr. Tom Wilson, whose subsequent death I record with regret, gave the large private collection made by himself and Mr. W. H. Bush in British Columbia. The insects collected on the Canadian Arctic Expedition, 1913-16, have now been received, and arrangements are being made for their identification and description.

#### BRANCH OF THE CANADIAN COMMISSIONER OF THE INTERNATIONAL INSTITUTE OF AGRICULTURE.

NOTES.—On April 4, the opening of the new fiscal year was marked by the re-election, by the Permanent Committee, of Marquis Cappelli to the Presidency of the Institute. He had occupied this office for six years, and his address to the Permanent Committee reviewed briefly the progress that had been made during that time. At the beginning of that period its only organ was a meagre bulletin giving in a very few pages the then imperfect statistics of cereal production. It had now developed so as to be an international review of the statistics of practically all agricultural production and commerce. There was introduced during the same period the "International Review of the Science and Practice of Agriculture" and the "International Review of Agricultural Economics," both published in five different languages. The former is a review of reviews of agriculture, its material being abstracted from 2,500 periodical publications issued in all countries and written in all languages. This work is impossible of accomplishment by any particular individual or any existing institution. The "International Review of Agricultural Economics" served as the basis of the studies of the American Committee which visited Europe in 1913 to study co-operation and agricultural credit, the committee having begun their campaign at Rome by consulting the Institute experts and attending the meetings of the General Assembly then being held. In the same six years, the president continued, there were created the "International Year Book of Agricultural Statistics" and the "International Year Book of Agricultural Legislation," containing for each year the text of the most important agricultural laws in all countries. These results had been brought about by harmonious co-operation between the Permanent Committee and the employees of the staff, to whose efficiency the president paid a tribute. There was a tendency to extend the statistical data to the production and commerce of all agricultural products, and to the information necessary for a thorough appreciation of all the great economic movements such as freights and exchange, which refer directly or indirectly to the trade of these products. There was, moreover, a tendency to extend the Institute's activity to the whole scientific and practical movement connected with plant diseases and pests, to make the Institute the authorized centre and organ of all the agricultural laboratories and institutions in the world.

Later the president took up the same theme and read before the Permanent Committee the address on the International Institute made by the Minister of External Affairs of Australia, in which the latter also reviewed and highly commended the remarkable work accomplished during the past six years.



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*Financial Situation.*—The expenditure for the calendar year 1916 was 870,000 francs, and the cash held in reserve at the end of the year 691,000 francs. It is expected that the arrears of contributions, which are due chiefly by the central European belligerent governments, will be paid up after the war, as those governments have not ceased to derive the usual benefits from the Institute's operation.

*Sir Edward Buck, K.C.S.I.*, representative for India on the Permanent Committee, died at Rome on July 5, 1916. In the early spring he had undertaken to replace Sir James Wilson, the regular representative of Great Britain, India, and the British Dominions, during the latter's temporary absence in London. He was, however, unable to attend the last two meetings which preceded the summer holidays. Sir Edward Buck, formerly a Director of Agriculture for India, possessing high technical qualifications and the rare experience of a long and successful career, was a deeply convinced champion of the International Institute. He was one of the most active and effective workers in connection with the Institute's original organization, and, only a year or so before his death, made a strong appeal to the various British governments to increase their active support of and collaboration with the Institute.

*Changes in the Institute Staff.*—By reason of a successful competitive examination in October, 1915, Professor Lorenzoni was chosen to occupy the chair of political economy at the University of Macerata, and tendered his resignation as Secretary-General, to take effect from October 31, 1916. He was succeeded by Mr. Dragoni, Instructor General and Chief of the Service in the Italian Ministry of Agriculture, Commerce and Industries, and who had been connected with the settlement of important international questions. At the same time the Acting Secretary-General, Dr. Paul Van Hissenhoven, became free to devote himself exclusively to the statistical branch of the Institute work, of which he is the permanent chief. Dr. Hissenhoven is particularly well qualified for this work in consequence of his previous experience as secretary of the Antwerp Board of Trade and professor at the Antwerp Commercial Institute.

Professor Lorenzoni's retirement caused much regret, inasmuch as he had been connected from the start with the creation of the Institute, and, besides the duties of Secretary-General, filled with exceptional distinction the position of Chief of the Bureau of Economic and Social Institutions. It is unfortunate that his severance from the institute is chiefly the result of the protest of Austria because notwithstanding his being a native of Italia Irrendenta, he served a term at the front in this war in the Italian army.

*Ocean Freight Rates.*—One of the notable reports of the year was that undertaken by the retiring Secretary-General, Professor Lorenzoni, entitled "Ocean Freight Rates and the Transportation by Sea of Cereals." The first part of the report, presented in November, 1916, was received by the Permanent Committee with the highest commendation, and Professor Lorenzoni was charged by private arrangement to proceed with the completion of part II after his retirement from the Institute to undertake University work. This report, when completed, will serve as the basis for the discussions on this important question at the next General Assembly.



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*Control of Grasshoppers.*—In April, on the initiative of the Government of Morocco, Mr. Louis Dop, Vice-President of the Institute, introduced proposals for the purpose of bringing about international action in the control of grasshoppers and locusts. It was suggested by Mr. Dop that action should be especially directed towards suppressing the pest in its original breeding grounds. He was of the opinion that a permanent concerted campaign carried on by Egypt, Tripoli, Tunis, Algeria, Morocco, and West Africa would either abate or entirely suppress the periodical migration of the acridians. Measures of like nature had been adopted with success in South Africa and in South America. On the latter continent the convention organized in Montevideo, Uruguay, in 1913, had been followed by another congress after a visit had been made by specialists to the supposed original habitat of the acridians in Bolivia. On the proposal of the delegate for Russia that many other world states would be interested in the question, it was decided to consult the adhering Governments on the expediency of holding an International Conference, which might be held, as was the last International Meteorological Conference, just before the meetings of the General Assembly, by which its deliberations might be ratified. An elaborate monograph of 186 pages was prepared by the Bureau of Agricultural Intelligence and Plant Diseases and sent to the various Governments to aid them in coming to a decision.

*The Canadian Office.*—The "Bulletin of Foreign Agricultural Intelligence," which had been published since October, 1910, was discontinued with the December, 1916, number. This was done to give effect to a recommendation in the report of the Joint Committee of both Houses on the Printing of Parliament.

A section of the "Agricultural Gazette" (Part V) has been allotted in order to replace the Bulletin to some extent, and to continue to make available to Canadians the valuable information published by the Institute at Rome.

Among the more prominent articles published in the "Bulletin of Foreign Agricultural Intelligence" during the year were: "Co-operation in Minnesota," "Co-operative Dairy Societies in Great Britain," "The Value of Birds to Man," "Review of the World's Agricultural Legislation of 1914," "Co-operative Abattoirs in Denmark," "Insurance Conditions in Reference to the Transport of Cereals," "Droughts and Hot Weather," "Entomophagous Insects and their Practical Employment in Agriculture," "The United States Federal Farm Loan Act," "Protection of Orchards against Frost," "Protection of Birds in Canada and the United States," "International Control of Ocean Carriage and Freight Rates," "Meteorology and Agriculture," "Wheat and the War, 1915-16 and 1916-17," and other similar editorial reviews of the world's cereal situation.

A large number of inquiries for more information than was furnished in the summarized articles published in the Bulletin were answered during the year. In many cases the original article and additional information were procured from the author or the Institute.

A limited number of the three original Institute Bulletins, "The International Review of the Science and Practice of Agriculture," "The International Review of Agricultural Economics," and "The International Crop Report and Agricultural Statistics," in French and in English, are received from Rome by the Institute Branch. These are sent to a list of Government officials and experts in different lines



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of agriculture. A number of copies are held in reserve at the branch to be sent occasionally to readers of the Foreign Intelligence section of the "Agricultural Gazette," who wish to receive more details of the information therein outlined.

*Library of the Institute Branch.*—The library records show that there were, on March 31, 3,448 bound books and 27,130 unbound books and pamphlets, irregular serials being included in the latter term. The United States periodical "Agricultural Index," received by the library, covers pretty thoroughly all current agricultural literature of the English-speaking countries. Practically all of the periodicals therein indexed, together with many others received in exchange, in all some 350, are conveniently arranged on the library shelves.

The various card catalogues, about 165,000 in number, published by the United States Department of Agriculture and the Library of Congress, have been kept up to date. These are of great assistance to the experts making use of the library, an effective means of building up the library, and in compiling bibliographies.

While the library primarily serves the purposes of the Institute, it is sought to make it of the utmost assistance to agricultural experts, whether officials of the Federal Government or otherwise. It is of particular importance that an official should, by this means, be able to examine the latest books and publications to enable him to decide upon the acquisition of the ones most suitable for his own special purposes. Hence, lists of the volumes received were from time to time circulated among the various agricultural specialists.

## THE PUBLICATIONS BRANCH.

The work of the Publications Branch is continually on the increase. While the number of publications issued by the department was slightly less for the fiscal year of 1916-17 than in 1915-16, or sixty-two compared with sixty-six, the number of copies sent out exceeded that of the previous year by 215,283.

It is noteworthy that since the introduction of the Patriotism and Production and the Production and Thrift movements, the increase both of the mailing lists and of the general demand has been most marked, the total of 1914-15 over 1913-14 being 737,021; of 1915-16 over 1914-15, 1,284,981; and of 1916-17 over 1915-16, 215,283; or an aggregate increase in three years of 2,237,285.

In these circumstances the comparative growth from year to year warrants the assumption that the work will continue to develop in extent. This possesses the appearance of ever-widening appreciation of the efforts of the department to prepare and send forth informatory and advisory literature to farmers, breeders, fruit growers, and to amateurs who follow any one of these pursuits.

The steady increase from year to year of the number of publications sent out on request by mail from all parts of the country is evidence not alone of abiding influence, but also of the growth of intelligent interest in products of the soil by the public in general. This phase of the question is especially illustrated by the demand for publications bearing on the cultivation of home and school gardens. For a pamphlet entitled "The School Garden," 21,600 requests were received, apart from 1,800 dis-



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tributed according to mailing list; for another entitled "The Home Vegetable Garden," 15,300 requests were received; and for a third, entitled "The Home Vegetable Garden and Patriotic Garden Competition," 8,100 requests were recorded. For the complete Experimental Farms report altogether 114,360 requests were complied with, and for the divisional reports the total distribution reached 694,400. For "Seasonable Hints," in addition to 802,844 sent out as per mailing list, 14,460 were despatched in response to requests. Of entomological publications, 66,740 were circulated. In all, the requests responded to in 1916-17 numbered 333,767, in addition to 2,972,951 supplied to the regular mailing lists.

A complete statement of circulation for the year follows, and also a statement for the last five years indicating the expansion of the work of the branch:—

CIRCULATED IN 1916-17.

Character of Publications.	Mailing List.	Requests.
Reports . . . . .	782,690	149,690
Bulletins . . . . .	366,012	65,060
Seasonable Hints (3 issues) . . . . .	802,844	14,460
Pamphlets . . . . .	272,502	64,037
Circulars . . . . .	386,500	14,360
Leaflets . . . . .	131,000	
Gazette (12 issues) . . . . .	71,982	270
Foreign Agricultural Intelligence (9 issues) . . . . .	149,431	3,620
Agricultural Institute publications, original . . . . .	8,190	170
War Book . . . . .	1,800	22,100
Total . . . . .	2,972,951	333,767

COMPARATIVE STATEMENT FOR FIVE YEARS.

Year.	Names on Lists.	Number of Publications.	Number Mailed.	Increase over Preceding Year.
1912-13 . . . . .	168,292	48	1,450,000	
1913-14 . . . . .	178,000	59	1,069,433	
1914-15 . . . . .	202,000	46	1,806,454	737,021
1915-16 . . . . .	240,000	66	3,091,435	1,284,981
1916-17 . . . . .	306,200	62	3,306,718	215,283
Total in five years . . . . .			10,724,040	2,237,285

The methods of operation in circulation have been detailed in previous reports, but improvements are still being made from time to time and every effort is put forth to adopt expeditious and labour-saving devices. In common with other branches of the service, the circulation, recording, storing, and despatching divisions of the branch have suffered in the loss of experienced help. Female labour has been substituted to some extent for male labour, and to partially supply the place of seven young men who have joined the overseas force and two others who have secured engagements elsewhere. There are now employed in the branch, including the editorial staff of *The Agricultural*



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*Gazette*, thirty-six people, comprising twenty-five men and eleven women. Of these, twenty are clerks, four messengers, and twelve packers.

During the year *The Agricultural Gazette* has ranged in volume each month from eighty to ninety-six pages, and has contained contributions, varying from one to fifteen from each contributor on different subjects, from 180 officials of the Federal Department of Agriculture or of the agricultural, educational or other departments of the nine provinces of the Dominion, in addition to the writings of the editorial staff. Each month symposia have been given of the subjects more immediately receiving the attention of the various provincial governments. Every effort has been made to make these as complete as possible in order that the whole country might be covered and the activities of each province be known one to the other.

A large amount of work in connection with the revision and growth of the mailing lists was done. During the past fiscal year about 120,000 new stencils were embossed. In the work of revision, 16,150 addresses were changed or cancelled. On the addressing machines, 2,408,700 envelopes were addressed. A total of 435,000 stencils were used.



III. PATENTS OF INVENTION.

The following tables show the transactions of the Patent Office, Department of Agriculture, from April, 1916, to March 31, 1917:—

Applications for patents.....	8,751
Patents and certificates granted—	
Patents.....	7,520
Certificates.....	1,599
Total .....	9,119
Caveats.....	358
Assignments of Patents.....	3,661
Notices under section 8.....	831

Receipts.		Expenditure.	
	\$    cts.		\$    cts.
Cash received.....	227,094 09	Salaries.....	90,850 00
Cash refunded.....	3,777 39	Patent record.....	28,916 91
			119,766 91
		Receipts over expenditure.....	103,549 79
Net cash.....	223,316 70		223,316 70

DETAILED STATEMENT Patent Office Fees for Year 1916-17.

Month.	Notices.	Patents.	Assignments.	Certified Copies.	Caveats.	Sundries.	Subscription.	Total.
1916.	\$    cts.	\$    cts.	\$    cts.	\$    cts.	\$    cts.	\$    cts.	\$    cts.	\$    cts.
April.....	174 00	17,905 20	752 90	297 05	190 00	5 00	16 10	19,340 25
May.....	156 00	19,236 95	784 15	237 35	160 00	29 16	12 80	20,616 41
June.....	150 00	15,922 80	603 80	230 81	205 00	22 15	52 20	17,186 76
July.....	126 00	15,212 57	624 50	304 75	189 00	14 45	28 80	16,500 07
August.....	102 85	14,777 55	609 95	257 55	143 00	14 00	6 95	15,911 85
September.....	134 00	15,385 69	585 35	221 90	125 00	10 00	7 85	16,469 79
October.....	130 90	15,998 40	670 10	243 80	165 00	12 40	42 40	17,263 00
November.....	111 00	16,822 62	573 10	263 85	170 00	12 90	31 20	17,984 67
December.....	124 00	16,791 90	733 84	171 85	125 00	13 00	38 65	17,998 24
1917.								
January.....	164 40	22,379 44	804 95	362 67	165 00	20 25	28 69	23,925 40
February.....	132 00	18,911 00	860 00	248 64	165 00	11 00	13 55	20,341 19
March.....	157 00	22,001 48	800 28	288 75	213 00	47 65	48 30	23,556 46
	1,662 15	211,345 60	8,402 92	3,128 97	2,015 00	211 96	327 49	227,094 09



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The total number of patents granted to Canadian inventors was 1,091, and were distributed among the provinces of the Dominion as follows:—

Ontario.. . . . .	465
Quebec.. . . . .	287
British Columbia.. . . . .	72
Manitoba.. . . . .	84
Alberta.. . . . .	59
Saskatchewan.. . . . .	62
New Brunswick.. . . . .	29
Nova Scotia.. . . . .	29
Prince Edward Island.. . . . .	3
Yukon.. . . . .	1

Patents issued to residents of Canada, with the ratio of population to each patent granted:—

Provinces.	Patents.	One to Every.
Manitoba.. . . . .	84	5,423
Ontario.. . . . .	465	5,426
British Columbia.. . . . .	72	5,451
Alberta.. . . . .	59	6,350
Quebec.. . . . .	287	6,979
Saskatchewan.. . . . .	62	7,942
Yukon.. . . . .	1	8,512
New Brunswick.. . . . .	29	12,134
Nova Scotia.. . . . .	29	16,977
Prince Edward Island.. . . . .	3	31,242

Statement of the number of patents issued under the Act, on which the fees are paid for periods of six, twelve, or eighteen years, at the option of the patentee; and of patents on which the certificates of payments of fees were attached after the issue of patents originally granted for periods of six and twelve years:—

Period for which fees were paid on first issue—		
6 years.. . . . .		7,493
12 “ . . . . .		4
18 “ . . . . .		23
Patents on which Certificates were attached after issue—		
6 years.. . . . .		1,555
12 “ . . . . .		44
Reissues—		
6 years.. . . . .		10
12 “ . . . . .		2
18 “ . . . . .		1

COMPARATIVE STATEMENT of the transactions of the Patent Office from 1907 to 1917, inclusive.

Years.	Applica- tions for Patents.	Patents and Certificates Granted.			Caveats.	Assign- ments of Patents.	Fees received.
		Patents.	Certifi- cates.	Total.			
							\$ cts.
1907.....	7,077	6,121	634	6,755	285	3,003	169,548 78
1908.....	7,406	6,774	744	7,518	317	2,900	178,482 49
1909.....	7,239	6,395	827	7,222	319	3,001	176,692 05
1910.....	7,789	7,223	1,010	8,233	448	3,147	194,571 54
1911.....	8,037	7,249	1,002	8,251	406	3,256	200,164 41
1912.. . .	8,293	7,399	1,113	8,512	348	3,725	207,762 77
1913.....	8,681	7,502	1,199	8,701	353	3,741	218,125 02
1914.....	8,359	7,918	1,323	9,241	354	3,432	215,001 71
1915.. . .	7,302	6,867	1,211	8,078	391	3,391	150,028 37
1916.....	7,793	6,812	1,419	8,231	419	3,311	202,630 40
1917.....	8,751	7,520	1,599	9,119	358	3,661	227,094 09



NATIONALITY OF INVENTORS.

Countries.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.
United States of America .....	5,021	4,885	4,997	4,961	5,220	4,645	4,972	5,772
Great Britain and Ireland .....	392	359	506	495	558	450	360	352
* Germany.....	241	304	336	307	300	107	14	10
Australia. ....	60	77	99	75	76	76	76	62
France .....	75	97	108	100	115	83	55	45
New Zealand.....	37	33	46	47	50	29	31	37
Sweden .....	39	54	52	64	40	40	44	43
Belgium.....	20	25	20	23	33	19	21	5
Austria ...	23	20	24	40	35	11	0	0
Italy.....	8	12	6	16	14	15	8	8
Switzerland.....	12	26	23	20	22	14	22	10
Denmark .....	8	5	14	15	16	11	12	18
Transvaal.....	12	16	10	7	1	3	3	3
Hungary.....	7	6	6	6	5	5	0	0
Russia.....	14	18	6	17	13	9	5	6
Norway.....	18	20	17	10	32	24	29	20
Newfoundland .....	2	3	1	2	1	1	1	0
Netherlands.....	0	0	.....	.....	7	4	2	2
Mexico.....	11	7	10	8	7	4	4	0
Cape Province.....	0	3	4	4	1	0	0	1
Cuba.....	1	5	1	1	9	3	0	0
Spain .....	1	3	.....	.....	1	1	3	0
Chile.....	0	1	.....	1	0	0	1	0
Finland.....	0	1	.....	1	0	0	0	0
Portugal .....	0	0	.....	.....	0	1	0	0
Roumania.....	0	1	1	.....	0	1	0	0
Grand Duchy of Luxemburg.....	0	0	.....	.....	0	3	0	0
Algeria .....	0	1	.....	.....	0	0	0	0
Japan .....	2	0	2	2	1	3	2	1
India.....	0	5	3	1	7	3	0	0
Natal .....	0	0	1	2	0	0	1	0
Nicaragua.....	0	1	.....	.....	0	0	0	0
Brazil ...	0	2	1	.....	1	3	0	2
Turkey.....	0	0	.....	.....	0	0	0	0
Poland.....	2	0	.....	.....	0	0	0	0
Holland .....	2	11	8	7	8	5	2	7
Argentine Republic.....	5	1	1	.....	2	3	5	3
Panama (Canal Zone).....	0	0	3	.....	3	0	1	0
Egypt .....	1	1	.....	.....	1	1	0	1
Southern Rhodesia.....	1	.....	.....	.....	0	0	2	0
Peru ..	.....	.....	3	2	0	0	0	1
Hawaii.....	.....	.....	3	3	0	0	2	4
Venezuela..	.....	.....	2	1	1	0	0	0
Trinidad.....	.....	.....	1	.....	0	0	0	0
Porto Rico.....	.....	.....	1	2	0	0	0	0
Tunis.....	.....	.....	.....	1	0	0	0	0
Ceylon.....	.....	.....	.....	1	0	0	0	0
Straits Settlements.....	.....	.....	.....	1	0	0	0	3
Philippine Islands.....	.....	.....	.....	.....	1	1	2	0
Canary Islands.....	.....	.....	.....	.....	1	0	0	0
Java.....	.....	.....	.....	.....	1	0	0	0
Channel Islands.....	.....	.....	.....	.....	1	0	0	2
China.....	.....	.....	.....	.....	.....	1	0	0
West Indies.....	.....	.....	.....	.....	.....	1	0	0
Isle of Man.....	.....	.....	.....	.....	.....	1	0	0
Norfolk Islands (South Pacific).....	.....	.....	.....	.....	.....	2	1	0
Alaska .....	.....	.....	.....	.....	.....	2	1	5
Bermuda .....	.....	.....	.....	.....	.....	1	2	0
Zululand .....	.....	.....	.....	.....	.....	0	1	0
Central America.....	.....	.....	.....	.....	.....	.....	.....	1

\* These ten patents were granted during the year to assignees of subjects of the Emperor of Germany ; the assignment to citizens of countries not at war with Great Britain having been made previous to the outbreak of hostilities.

The total number of reports issued by the examiners during the year was 13,019 and 13 patents were surrendered and reissued.



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Out of the total number of patents granted by this office during the year there were 5,772 issued to inventors or assignees resident in the United States, being 76 per cent of the whole issue. There were more patents granted to citizens of the United States during the last fiscal year than in any previous year of record.

This branch of the department continues to receive the official reports of patents from Great Britain, Australia, New Zealand, United States, Mexico, Portugal, Italy, Belgium, France, and Japan, in addition to other periodicals of a scientific nature, in exchange for the Canadian Patent Office Record.

There were 2,198 patents brought under the conditions of the compulsory license clause, section 44 of the Patent Act.

The number of notices under section 8 of the Patent Act was 831.

Since the declaration of war, the following licenses were granted under the Orders and Regulations respecting Patents of Invention, made under "The War Measures Act, 1914":—

Number of Patent.	Name of Registered Owner.	Short Title.	Name and Address of Licensees.	Date of Grant.
133636	Farbwerke Vorm. Meister Lucius & Bruning assignee of Paul Ehrlich and Alfred Bertheim.	The Manufacture of New Derivatives of the Para-Oxyarylar-sinic acids.	Ernest Neil Macallum and Charles Newton Candee, Jr., trading under the name and style of the Synthetic Drug Company, Toronto, Ont.  Gustave Archambault, M.D., Montreal, Que.	Nov. 28, 1914.
152320	Farbwerke Vorm. Meister Lucius & Bruning assignee of Paul Ehrlich and Alfred Bertheim.	The Manufacture of New Derivatives of the Para-Oxyarylar-sinic acids.	Ernest Neil Macallum and Charles Newton Candee, Jr., trading under the name and style of the Synthetic Drug Company, Toronto, Ont.  Gustave Archambault, M.D., Montreal, Que.	
144873	Farbwerke Vorm. Meister Lucius & Bruning assignee of George Korndörfer.	The Manufacture of Derivatives of Dioxydiamino-arsenobenzene.	Ernest Neil Macallum and Charles Newton Candee, Jr., trading under the name and style of the Synthetic Drug Company, Toronto, Ont.  Gustave Archambault, M.D., Montreal, Que.	
144874	Farbwerke Vorm. Meister Lucius & Bruning assignee of George Korndörfer and Baptist Reuter.	The Manufacture of Derivatives of Diamidodioxy-arsenobenzene.	Ernest Neil Macallum and Charles Newton Candee, Jr., trading under the name and style of the Synthetic Drug Company, Toronto, Ont.  Gustave Archambault, M.D., Montreal, Que.	
78745	Hülsberg & Co. Gesellschaft mit beschränkter Haftung, assignee of Max Rüping.	Improvements in or relating to the Impregnation of Wood and Other Porous Materials.	Vancouver Creosoting Co., Ltd., Vancouver, B.C.	July 12, 1916.
92353	Hülsberg & Co. Gesellschaft mit beschränkter Haftung, assignee of Max Rüping.	The Impregnation of Wood and other Porous Materials.	Vancouver Creosoting Co., Ltd., Vancouver, B.C.	



IV. COPYRIGHTS, TRADE MARKS, INDUSTRIAL DESIGNS AND  
TIMBER MARKS.

STATEMENT of Fees received by the Copright and Trade Mark Branch from April 1,  
1916, to March 31, 1917.

Month.	Trade Marks.	Copy- rights.	Designs.	Timber Marks.	Assign- ments.	Copies.	Totals.
1916.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
April.....	2,792 24	125 54	82 50	19 90	76 00	11 50	3,107 68
May .....	2,566 05	125 50	128 00	4 25	31 50	58 00	2,013 30
June.....	2,766 50	115 75	134 50	2 00	71 00	17 50	3,107 25
July.....	2,289 90	98 00	110 00	4 00	31 00	28 75	2,561 65
August.....	1,827 00	130 75	131 00	6 00	48 00	35 00	2,177 75
September..	2,380 00	109 00	60 00	6 00	36 00	27 00	2,618 70
October.....	2,892 00	131 60	100 00	6 00	58 00	45 00	3,232 60
November. .	2,584 82	149 60	135 00	14 00	32 00	53 75	2,969 17
December.....	2,430 63	164 65	73 80	2 00	27 00	33 25	2,731 33
1917.							
January.....	3,261 73	128 30	83 50	20 00	125 00	38 10	3,656 63
February.....	2,636 55	139 70	140 00	26 00	43 00	35 65	3,020 90
March.....	3,036 50	160 50	391 00	12 00	95 50	36 75	3,732 25
	31,463 92	1,578 89	1,569 30	122 15	674 00	420 25	35,829 21
Refunds... ..	6,944 90	21 00	197 00	2 00	19 50	2 00	7,186 40
	24,519 02	1,557 89	1,372 30	120 15	654 50	418 25	28,642 81

The particulars of the registrations made by the Copyright and Trade Mark  
Branch of the Department of Agriculture during the year ended March 31, 1917, are  
as follows:—

I. Copyrights—	
Full copyrights without certificates.. . . . .	1,082
Full copyrights with certificates.. . . . .	150
Temporary copyrights without certificates.. . . . .	30
Temporary copyrights with certificates.. . . . .	....
Interim copyrights without certificates.. . . . .	112
Interim copyrights with certificates.. . . . .	10
Renewals of copyrights.. . . . .	4
Assignments.. . . . .	53
	1,441
II. Trade marks.. . . . .	840
Renewals of specific trade marks.. . . . .	74
Assignments of trade marks.. . . . .	249
III. Industrial designs.. . . . .	196
Renewals.. . . . .	38
Assignments.. . . . .	27
IV. Timber marks.. . . . .	55
Assignments.. . . . .	4
Total registrations.. . . . .	2,924
V. Letters received.. . . . .	6,822
VI. Letters sent.. . . . .	7,075



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The following table shows a comparative statement of the business of this branch from 1904 to 1916, inclusive:—

Year.	Letters Received.	Letters sent.	Copyrights Registered.	Certificates of Copyright.	Trade Marks Registered.	Industrial Designs Registered.	Timber Marks Registered.	Assignments Registered.	Fees Received Gross.	Fees Received Net.
									\$ cts.	\$ cts.
1904.....	2,858	3,293	1,106	228	621	107	25	118	20,647 30	
1905.....	3,367	3,902	1,130	189	661	139	22	154	23,706 75	
1906.....	5,340	5,193	1,228	169	1,119	125	47	282	33,107 10	
1907.....	4,475	4,353	1,140	175	848	182	39	136	30,073 20	
1908.....	6,647	4,980	1,416	170	892	162	44	343	37,514 00	
1909.....	6,320	5,750	1,535	171	1,059	143	108	174	38,071 31	
1910.....	6,411	7,688	1,699	206	1,021	118	39	386	42,153 76	
1911.....	7,027	7,091	1,593	213	1,212	149	39	230	43,327 86	
1912.....	9,435	9,322	1,760	205	2,315	228	15	559	51,043 21	43,061 56
1913.....	8,441	9,220	1,835	207	1,378	165	57	264	49,409 68	41,251 98
1914.....	2,190	9,292	1,675	193	1,106	224	24	242	39,599 69	32,840 87
1915.....	6,815	7,446	1,477	146	1,019	215	27	279	35,653 21	29,645 11
1916.....	6,822	7,075	1,384	160	840	196	55	333	35,829 21	28,642 81



## V. PUBLIC HEALTH AND QUARANTINE.

Perhaps the most noted event during the year from the Public Health standpoint has been the epidemic outbreak of infantile paralysis in the United States, and to a much less extent in Canada.

Other infectious diseases have not prevailed to any unusual extent during the year.

At the coast quarantine stations on the Atlantic and Pacific coasts, 168,857 persons have been inspected. In 1914, the last year before the war, the number was 582,697.

The admissions to the quarantine hospitals were 96. In the last year before the war the number was 1,996.

In every instance the disease was stamped out at the station, and so prevented from appearing inland.

From the middle of August until the end of November the production was required of certain prescribed certificates from all children under sixteen years of age desirous of entry into Canada from the states affected with infantile paralysis, over the international boundary between the Dominion and the United States.

*Asiatic Cholera.*—During the past year this disease has been reported in the following countries: Austria-Hungary, Borneo, Ceylon, China, Egypt, Germany, Greece, India, Indo-China, Japan, Java, Korea, Persia, Philippine Islands, Russia, Siam, Straits Settlements, Turkey in Asia, and Turkey in Europe.

On account of the prevalence of cholera in many localities in the Orient, steerage passengers arriving at the British Columbia quarantine station at William Head were subjected to bacteriological examination and were not admitted to entry until it had been determined by such examinations that they were not cholera carriers. By the 24th of February last the threatening had so far passed that such examinations were suspended. Similar action was taken at the same time at the quarantine stations of the contiguous states on the Pacific.

*Bubonic Plague.*—This disease has been reported during the year in the following countries: Argentina, Azores, Brazil, Ceylon, Chile, China, Ecuador, Egypt, Great Britain, Greece, Hawaii, India, Indo-China, Japan, Java, Mauritius, Persia, Peru, Russia, Straits Settlements, Siam, Union of South Africa, British East Africa.

In Great Britain eleven cases of human plague have been reported during the year. Three in Bristol, two in Hull with one death, and six in Liverpool with three deaths.

Plague-infected rats have been found in London and in Liverpool during the year. Precautionary measures were taken at our Atlantic ports to prevent the landing of rats from vessels arriving.

Plague-infected rats have also been found during the year in Hong Kong, Shanghai, and Hawaii; and at New Orleans, La., and Seattle, Wash., in the United States. In California, plague continues also amongst the ground squirrels.



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In India the following figures give some indication of the ravages of this disease: October 15 to December 23, 1916, cases 89,512, deaths 67,068; December 31, 1916, to January 13, 1917, cases 30,487, deaths 23,538; January 21 to 27, cases 15,872, deaths 12,783.

*Smallpox.*—This disease has had its usual worldwide prevalence again this year. It has not shown itself at any of my Atlantic stations, owing possibly to the small number of passengers arriving from Europe. It has been brought from the Orient to the British Columbia station by two steamships.

*Typhus Fever.*—This disease, one of the oldest diseases of which record can be found, was, up to two years ago, an almost forgotten malady, at any rate as an epidemic, though always more or less present in many countries where sanitation is backward, such as the Balkans, Turkey, Persia, Arabia, China, and most of Asia. Now, however, war conditions have spread the disease through Serbia, and disturbed economic conditions in Mexico have disseminated the infection far and wide in that country, where it has always been present in a limited or endemic form.

*Yellow Fever.*—The results of the application of the steps to prevent and destroy the mosquito host of the yellow fever germ have reduced this disease to a negligible quantity as far as this continent is concerned. Its principal habitat now seems to be the west coast of Africa.

*Enteric Fever.*—One of the striking things about this war is the triumph of science over this disease. During the Boer war it was stated that one man out of every nine in the British force in South Africa was invalided through this disease. In the Spanish-American war, of 107,000 men in camps, 20,000 contracted the disease. Whilst our own Department of Militia has just announced that during the twelve months ending December 31 last, only 167 cases of typhoid fever occurred amongst the many thousands of men of the Canadian Expeditionary force in Canada.

*Leprosy.*—There are at present in the lazaretto at Tracadie, N.B., thirteen lepers, six males and seven females. This is the smallest number for very many years, and only about half the number present a few years ago. Ten are of French-Canadian origin, one of Icelandic, one of Russian, and one of Assyrian.

There were two deaths during the year. No admissions. Amelioration of symptoms and sufferings continues to be observed under the treatment now being carried out.

The two former inmates discharged, apparently cured, in 1912, and the two residents seemingly now free from the disease, remain without any indication of its recurrence.

Officers report their high admiration of the continued devotion of the nursing religious sisters in their attendance on the lepers.

At the leper lazaretto at Darcy Island, B.C., five lepers have been admitted during the year. One, a Japanese, was deported; one, a Russian, was, after three months' observation, released under certain conditions of periodic examination, as not being a menace to the public health; the remaining three, being two Chinese and one Chilean-Kanaka, are still under treatment and care.



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*Beri-beri.*—The importance which diet plays in the production, prevention, and treatment of this disease is now generally recognized. When certain substances are lacking, nutrition suffers, and when they are removed disease supervenes. Diseases of this nature have been denominated deficiency diseases, of which one of the most typical would seem to be beri-beri.

*Anthrax.*—A fatal case of this disease was reported on the 8th instant as occurring at Longwood, in the vicinity of Huddersfield, England, in an employee in a woollen mill at that place. The wool originated mostly in the East Indies. A second case occurred on the 15th instant.

*Infantile Paralysis.*—In view of the large number of cases of this disease—stated to be 24,000 in all—in the neighbouring States, instructions were issued in August last requiring every person under sixteen years old, desiring to enter Canada over our land frontier, coming from any one of the affected group of states to produce a certificate properly attested, stating that the bearer had not the disease, nor had been in contact with any one who had. This certificate had to be issued not longer than twenty-four hours before departure. This requirement was raised at midnight of November 30 last.

*Precautions against rats.*—Owing to the reported finding of plague-infected rats at Liverpool, it was thought necessary that steps should be taken to prevent the landing of rats from vessels at the Atlantic ports.

The precautions are:—

The breasting out of the vessel from the pier for not less than six feet.

The placing on every hawser between the vessel and the pier of a funnel or disc of metal, not less than three feet in diameter and not more than three feet from the vessel.

The reduction of the gangways to a minimum by day and their guarding by quartermasters. At night all gangways to be withdrawn, or if one be essential, that it be lighted as well as guarded.

As once a quarantine clearance is given, incoming vessels pass from my jurisdiction to that of the Minister of Marine, that department undertook to instruct its harbourmasters at all Atlantic ports to have these precautions enforced.

*Cerebro-spinal Meningitis.*—Information was received from the Militia Department this spring that certain soldiers returning to Canada by way of St. John, N.B., were supposed to have been in contact with cases of cerebro-spinal meningitis before embarking at Liverpool. These men were detained at quarantine for special examination by the bacteriologist there. His report was that the cultures were negative in all cases.

*Circulars.*—Circular letters were issued from time to time to the different officers, drawing their attention to the various matters during the year connected with the appearances and movements of epidemic disease abroad.

*Public Health Meetings.*—During the year the Director-General of Public Health attended the annual meeting of the Canadian Public Health Association for the Prevention of Tuberculosis at Quebec in September.



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*Public Works Health Act.*—The inspectors report that the year has been exceptionally free from infectious disease amongst the workmen employed in the various works connected with railway construction, canals, and tunnels. They report the medical service as satisfactory, and the sleeping quarters and boarding of the men employed fully equal to the good conditions of previous years.

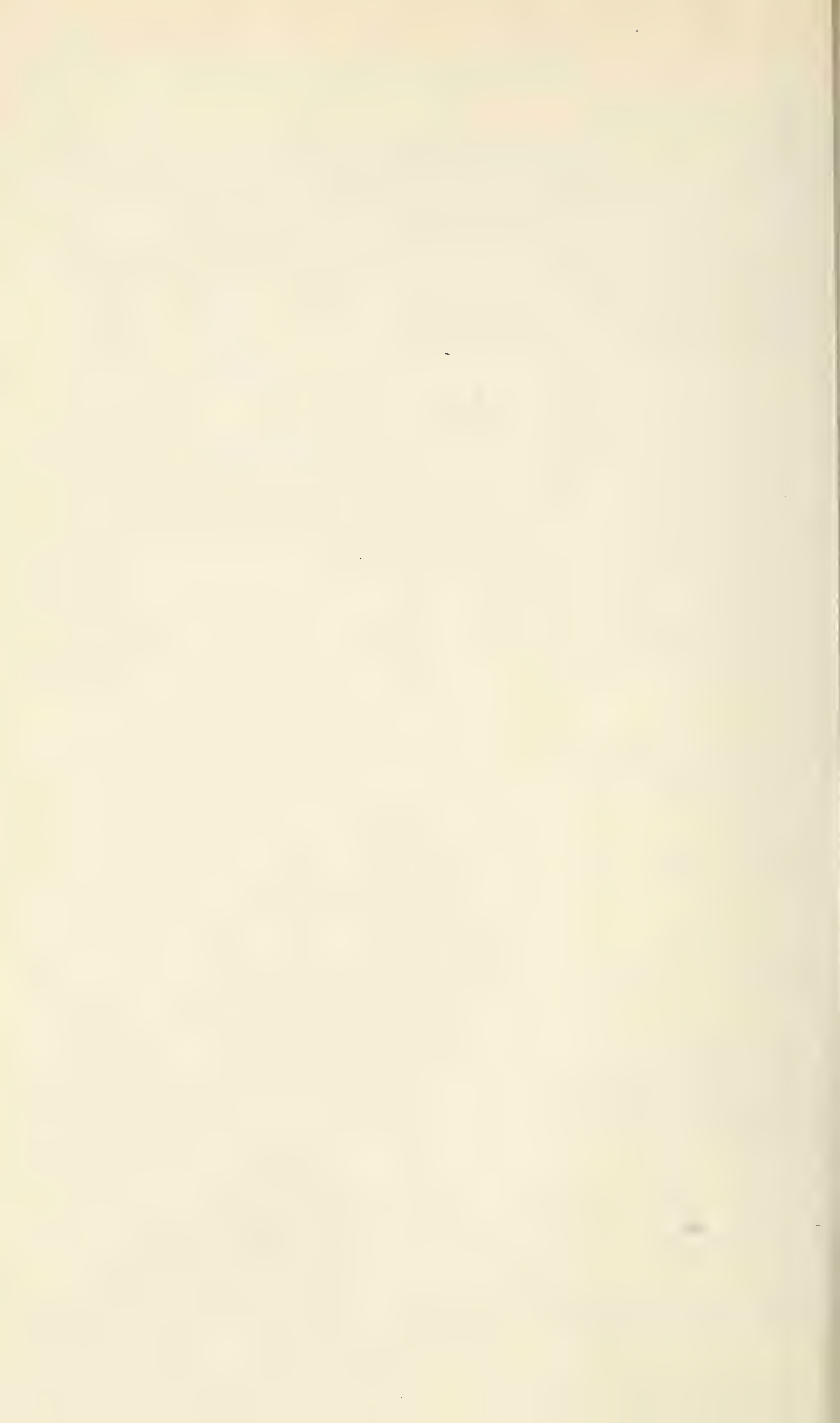
*Changes in the Medical Staff.*—At Halifax, N.S., Dr. J. V. Graham has replaced Dr. Blackett as substitute for Dr. V. N. Mackay, overseas. At St. John, N.B., Dr. Heagerty again took winter duty for Dr. Warwick, overseas. At William Head, B.C., the position of assistant medical officer and bacteriologist is at present vacant. At Prince Rupert, B.C., Dr. John Cade is acting as a substitute for Dr. Tremayne, overseas.

The whole respectfully submitted,

MARTIN BURRELL,

*Minister of Agriculture.*







# PUBLIC HEALTH

## REPORT OF THE DIRECTOR-GENERAL OF PUBLIC HEALTH.

(F. MONTIZAMBERT, C.M.G., I.S.O., M.D.EDIN., F.R.C.S.E., D.C.L.)

MARCH 31, 1917.

SIR,—I have the honour to submit this my report as Director-General of Public Health for the year ending this day.

At your various coast quarantine stations the number of persons inspected, and of persons admitted to your quarantine hospitals continue to show a marked decrease owing to the enormous falling-off in immigration and passenger travel on account of the war.

The number of vessels inspected continues to show an increase, in part at least due to the withdrawal for war purposes of large vessels and their replacement by more numerous smaller ones.

Along a considerable portion of your frontier international quarantine line precautions have had to be taken against the inroads of *Anterior Poliomyelitis* (infantile paralysis) which has been present during a part of the year as an epidemic in some of the adjoining states.

*Asiatic Cholera*.—Since my last annual report this disease has been reported in the following countries: Austria-Hungary, Borneo, Ceylon, China, Egypt, Germany, Greece, India, Indo-China, Japan, Java, Korea, Persia, Philippine Islands, Russia, Siam, Straits Settlements, Turkey in Asia, and Turkey in Europe.

On account of the prevalence of Cholera in many localities in Asia, steerage passengers arriving at your British Columbia quarantine station at William Head were subjected to bacteriological examination, and were not admitted to entry until it had been determined by such examination that they were not cholera bacillus carriers. This was continued until the 24th of February last. Up to that time 1,087 bacteriological examinations were made. No cholera carrier was found. At that date the threatening had so far passed that this examination ceased to be necessary, and was consequently suspended. Similar action was taken at the same time at the contiguous United States stations.

In the British Medical Journal, September 30, 1916, Capt. H. Grame Gibson, R.A.M.C., gives the following account of a new solid medium for the isolation of the cholera vibrio:—

Based on the fact that the cholera vibrio alone of all the intestinal organisms acidifies starch, the following alkaline medium has been devised for its rapid isolation.

Owing to the medium possessing differentiating properties it should be especially useful in the detection of "cholera carriers," as the faeces emulsified in broth can be plated directly on to it. In the case of water examination, after enrichment in peptone water for a few hours, if a drop or two of the peptone water is plated a tentative diagnosis can be arrived at in eighteen hours owing to the allied vibrios taking a longer time than the true cholera vibrio to



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bring about acid production. The formula is: Agar 30 grams, peptone 10 grams, starch 10 grams, sodium bicarbonate 1.5 grams, litmus (sufficient to colour medium), and water 1,000 c.cm.

Weigh out 30 grams of powdered agar and emulsify with 250 c.cm. of cold water. Then weigh out 10 grams of peptone (Chapoteaut and 1.5 grams of sodium bicarbonate. Mix together and emulsify in another 250 c.cm. of cold water. The two emulsions are then mixed in a two-litre flask and another 500 c.cm. of water added. The solution is complete in the steamer. When dissolved the medium is clarified with white of egg and filtered in the steamer.

Weigh out 10 grams of potato starch, emulsify it with some of the filtered agar, and add the emulsion to the remainder of the medium.

The whole is sterilized by the fractional method, after which enough sterile watery solution of litmus is added to bring about a blue colour of the medium.

The final reaction of the medium will be found to be -2 to phenolphthalein. I tried several degrees of alkalinity and found that 0.15 per cent sodium bicarbonate gave quite the best results.

If the plates are examined eighteen hours after inoculation, by looking obliquely through them with a dark background behind, the plate being held parallel to the window, the cholera colonies will be seen to have acquired a faint pink colour, while the colonies of the other intestinal organisms are blue or of a whitish colour. The examination is facilitated by the use of a hand lens. At this time the allied vibrios also produce blue colonies, but at the end of about thirty-six hours they also acidify the medium, though to a less extent than cholera.

At the end of twenty-four to thirty-six hours the cholera colonies have attained a delicate pink colour with a faint pink halo round them, while the other colonies still remain blue; also the colonies are of a good workable size to pick off and proceed with the serological tests.

After forty-eight hours, if the cholera colonies are in excess and the plate spread somewhat thickly, the medium itself becomes distinctly acid, and colonies other than those of cholera take on the pink tinge. However, the cholera colony even at this time can still be distinguished by the deeper red centre which the other colonies lack.

The only other organisms which are known to acidify starch are some of the diphtheroid group and some of the non-pathogenic water vibrios. These should not present any great difficulty, as Gram's stain on the one hand, and the serological test on the other, dispose of these organisms.

*Experiment 1.*—Ten cubic centimeters of broth were inoculated by emulsifying some faeces in it. To this was added a very small quantity of a culture of *V. cholerae*. The tube was well shaken, and 0.25 c.cm. of the broth transferred to a second tube of broth. Two drops of this broth were immediately plated on to the medium, the same rod being successively used for three plates. The first plate was too crowded to be of any use, but the second and third plates gave good discrete colonies, and on these plates the cholera colonies could be recognized in eighteen hours. Every colony on these plates was picked off, and all the pink colonies were proved to be cholera, whilst the blue colonies in every case proved otherwise.

*Experiment 2.*—The first broth tube from the previous experiment was kept at room temperature for two days. At the end of that time 0.25 c.cm. of this broth was added to 10 c.cm. of fresh broth, and a drop of this was immediately plated out as in the first experiment. The plates were rather too thickly spread to give good discrete colonies, but the cholera colonies could be easily detected. These colonies were again tested with cholera immune serum, and the differentiation proved correct.



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*Experiment 3.*—This experiment was undertaken to see whether any of the normal water vibrios were capable of acidifying starch. The water was taken from a pond after heavy rain, and was taken straight to the laboratory. Some of the water was first enriched by incubating in peptone water for a few hours. One drop of this peptone water was then plated, and at the end of eighteen hours a few pinkish colonies were present. Some more of the water was plated direct, and in this case it took twenty-four hours before any pinkish colonies appeared. In both cases the pink colonies that were present were of a lighter shade than that which is produced by the cholera vibrio, and I do not think that they are very likely to be confounded with it. In addition, the red centre to the colony that is produced by the cholera vibrio in forty-eight hours was not present in these cases. This organism proved to be a normal vibrio of water..

*Other Experiments.*—The following organisms were also plated out: *B. typhosus*, *B. paratyphosus* A, *B. paratyphosus* B, coliform organisms, *B. dysenteriae* (Shiga and Flexner), *B. enteritidis* (Gaertner), streptococci, V. Finkler Prior, *V. metchnikovi*.

In no case did the above organisms acidify the medium, except in the case of the two vibrios, which produce a slight pink halo, but the colonies themselves, when viewed obliquely, do not become pink until a very much longer time has elapsed than that required to recognize the vibrio of cholera.

In a recent number of *The American Journal of Tropical Diseases and Preventive Medicine*, Allan J. McLaughlin, United States Public Health Service, Commissioner of Health of the Commonwealth of Massachusetts, says in speaking of improvement in media:—

One other advance in our methods of handling Asiatic cholera suspects has been made by Goldberger, which promises to increase our efficiency in detecting Asiatic cholera carriers when making stool examinations on a large scale.

There has been no great change in the bacteriologic methods of Asiatic cholera diagnosis in the past ten years, and these methods are based upon the procedure of the German Imperial Health Office.

As a time-saving measure, test tubes are used instead of large flasks for the peptone solution. This necessitates that the amount of feces added to the tube must be small, and if the vibrios are very scarce a carrier might be recorded as negative. Large flasks and many platings are impracticable on a large scale where the daily examinations may run in thousands. Goldberger's media permit the planting of relatively large quantities of feces, using the same convenient size of test tubes.

Goldberger suggests two enriching solutions, an alkaline egg peptone, and an alkaline meat infusion peptone. The cholera vibrio grows well in both solutions, though less luxuriantly than in ordinary cholera peptone. The multiplication of the ordinary fecal bacteria is markedly restrained, especially the colon bacillus. Goldberger's work shows that in his media the vibrios, if present even in small numbers, will increase and not be overgrown, even after seventy-two hours.

Goldberger's media were devised after a careful study and test of the various selective media suggested by Dieudonné, Neufeld and Wiothe, Esch. Pilon, Crenderopoulo and Panayotatou, Krumwiede, Pratt and Grund, Hoffman and Kutscher, Moldavan and others.



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The addition of Goldberger's media to our equipment should make the passage of an Asiatic cholera carrier through our quarantines still more unlikely. It is true that this medium has not yet been tested in actual field work, but the laboratory tests suggest that it is the most valuable addition to our cholera technic which has been made in recent years.

*Bubonic Plague.*—This disease has been reported during the year in the following countries: Argentine, Azores, Brazil, Ceylon, Chile, China, Ecuador, Egypt, Great Britain, Greece, Hawaii, India, Indo-China, Japan, Java, Mauritius, Persia, Peru, Russia, Straits Settlements, Siam, Union of South Africa, British East Africa.

How plague may be present in rats without making its appearance in man is well illustrated by the experience of the steamship *City of Durham*. The history of this vessel emphasizes what students of the subject know must be true, namely, that throughout the world there are many ports infected with plague in which the presence of the disease is not known because human cases have either not developed at all or not in sufficient numbers to attract attention. Such ports in turn undoubtedly serve as foci from which the infection is carried by rats to ships and thus to other ports.

The steamship *City of Durham* arrived at Hongkong August 23, 1916, without cargo, from Shanghai, China, and proceeded at once alongside of a concrete rat-proof wharf. Immediately upon arrival the ship was fumigated with 4 per cent sulphur dioxide. After the fumigation six dead rats were found. Examination of these rats showed that two of them were plague infected. The crew of 66 men were immediately examined and none found sick. The captain stated that no case of human plague had ever occurred aboard his ship.

This steamship is engaged in a geneal freight trade between New York, Boston, Philadelphia, and ports in the Far East, including Calcutta, Bombay, Rangoon, Vladivostok, Japan ports, Shanghai, Hongkong, and others. On her last voyage the ship left New York June 17, 1916, calling at Colon, Canal Zone, San Francisco, Muroran, Vladivostok, Shanghai, and Hongkong in the order named. The master of the ship stated that while en route between Colon and San Francisco a member of the crew died of "internal trouble" June 29 and was buried at sea. On previous voyages the ship had been alongside the wharves at Calcutta and Rangoon, but whenever tied to a wharf standard rat guards had always been used on all lines. It was further stated that rats had very seldom been seen on the ship and the master had never known of sick or dead rats being found on the vessel.

*Great Britain.*—Eleven cases of human plague have been reported during the year. Three in Bristol, August 18-31; two in Hull, August 19-31, with one death; and six in Liverpool, Sept. 22-Oct. 6, with three deaths.

The Local Board of Health of England and Wales stated that the three cases reported at Bristol occurred in persons connected with a rag factory in that city, and one of the cases at Hull was in a boy who had been at work on the steamship *Kench* lying at Hull for repairs. The three cases reported at Liverpool on September 22 occurred in residents in the stable warehouse district one mile distant from the waterfront, and were all in persons of the same family. The last plague-infected rat at Liverpool was reported found during the month of October, 1916. In London during the period from October 5 to November 6, 1916, out of 601 rats examined four were found plague-infected. The last plague-infected rat was found November 6, 1916.

Plague-infected rats have also been found during the year in Hong Kong, Shanghai, Hawaii; and in New Orleans and Seattle, Wash., in the United States. The last one at Seattle was reported by Surgeon Lloyd as having been on the 16th of this month at Pike Place market, between Pike and Pine streets, and was proved positive for plague infection on the 28th instant.



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In California plague infection continues also amongst the ground-squirrels. For the following summary with relation to places in California I am indebted to the Public Health Reports issued by the United States Public Health Service.

## RECORD OF PLAGUE INFECTION.

Places in California.	Date of Last Case of Human Plague.	Date of Last Case of Rat Plague.	Date of Last Case of Squirrel Plague.	Total Number Rodents Found Infected since May, 1907.
<b>Cities:</b>				
San Francisco . . . . .	Jan. 30, 1918.	Oct. 23, 1908.	None . . . . .	398 rats.
Oakland . . . . .	Aug. 9, 1911.	Dec. 1, 1908.	" . . . . .	126 rats.
Berkeley . . . . .	Aug. 28, 1907.	None . . . . .	" . . . . .	None.
Los Angeles . . . . .	Aug. 11, 1908.	" . . . . .	Aug. 21, 1908.	1 squirrel.
<b>Counties:</b>				
Alameda (exclusive of Oakland and Berkeley).	Sept. 24, 1909.	Oct. 17, 1909.	June 23, 1916.	293 squirrels; 1 wood rat.
Contra Costa . . . . .	July 13, 1915.	None . . . . .	June 28, 1916.	1,629 squirrels.
Fresno . . . . .	None . . . . .	" . . . . .	Oct. 27, 1911.	1 squirrel.
Merced . . . . .	" . . . . .	" . . . . .	May 12, 1916.	7 squirrels.
Monterey . . . . .	" . . . . .	" . . . . .	May 27, 1916.	38 squirrels.
San Benito . . . . .	June 4, 1913.	" . . . . .	July 1, 1916.	72 squirrels.
San Joaquin . . . . .	Sept. 18, 1911.	" . . . . .	Aug. 26, 1911.	18 squirrels.
Santa Clara . . . . .	Aug. 31, 1910.	" . . . . .	June 21, 1916.	32 squirrels.
San Luis Obispo . . . . .	None . . . . .	" . . . . .	Jan. 29, 1910.	1 squirrel.
Santa Cruz . . . . .	" . . . . .	" . . . . .	May 30, 1916.	5 squirrels.
Stanislaus . . . . .	" . . . . .	" . . . . .	June 2, 1911.	18 squirrels.
San Mateo . . . . .	" . . . . .	" . . . . .	June 21, 1916.	1 squirrel.

<sup>1</sup> Wood rat.

The work is being carried on in the following-named counties: Alameda, Contra Costa, Stanislaus, San Benito, Santa Cruz, Monterey, Merced and Santa Clara.

Passed Asst. Surg. Williams reported that a squirrel killed March 16, 1917, in San Mateo county, Cal., 2 miles west of San Mateo, was proved positive for plague infection March 29, 1917.

In June, 1916, a plague-infected squirrel was shot near Redwood city, San Mateo county. This was the first infected squirrel that had been found in this county. San Mateo county had constituted a presumably uninfected barrier between the city of San Francisco and the territory in which infected squirrels were known to be present. Redwood city, where the first squirrel was found, is 20 miles from San Francisco, while the locality where the second squirrel was found near San Mateo is 10 miles nearer the city. If this indicates that the infection is travelling north in San Mateo county, measures will need to be taken to prevent the further spread to the suburbs of San Francisco and the reinfection of the rats in the city.

In South America, Col. D. C. Howard, Chief Health Officer, Balboa Heights, Canal Zone, states:—

Bubonic plague has shown no decrease in its distribution in South America during the year of this report, but on the contrary has probably extended to localities previously considered non-infected or at most only in the suspicious class. One marked increase of this disease occurred in the vicinity of Paita, Peru, and an extension of the disease northward from Guayaquil, Ecuador, has taken place, involving the country districts in the vicinity of Manta and Bahia, Ecuador, these ports are a relatively short distance below the Colombian border and the prevalence of plague in these vicinities can only mean an extension of the disease northward and closer toward zone ports. In view of the fact that plague is so generally distributed, along the west coast of South America



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particularly, we have endeavoured to tighten and improve our anti-plague measures with reference to the ships in zone ports. Our local measures of breasting off, rat guarding, raising of gangways at night, fumigation, etc., have been watched very closely because the potential danger to the zone from the standpoint of rat introduction is much greater than through the agencies of human transmission. To this end mechanical cleanliness and improved sanitary conditions aboard ship have received careful attention, and the value of all these measures emphasized to the local shipping interests.

In India the following figures give some indication of the ravages of plague: October 15 to December 23, 1916, cases 89,512, deaths 67,068; December 31, 1916, to January 13, 1917, cases 30,487, deaths 23,538; January 21 to 27, cases 15,872, deaths 12,783.

*Smallpox.*—This disease has had its worldwide prevalence again this year. It has not shown itself at any of your Atlantic ports of entry, possibly from the small number of passengers arriving. It has been brought from the Orient to your William Head, B.C., station. In a speech made by Socialist Deputy Hoffmann in the Reichstag, March 22, he is said to have stated that there are 30,000 cases of smallpox in Germany and that the disease is spreading rapidly. This report, which has been repeated by newspapers in Austria, has been denied by the German authorities, who admit that there have been 135 cases of smallpox in Berlin alone, with eleven deaths.

*Typhus Fever.*—With regard to this disease the *Medical Record* says:—

Typhus fever, one of the oldest diseases of which record can be found, was up to two years ago an almost forgotten malady, at any rate, as an epidemic True, in many countries, in which sanitation was backward, and especially where domestic hygiene was lacking, typhus was endemic, and, as First-Lieut. Horace C. Hall points out in the *Military Surgeon*, November, 1916, in the Balkans, Turkey, Persia, Arabia, China, and in Asia generally typhus has been endemic since the earliest of folk-lore legends. And within the past three centuries, along lines of commercial intercourse and travel, the disease has become largely endemic in Russia, Poland, Austria, Germany, and Latin America. But, as said before, there has been no serious epidemic of typhus fever until war conditions spread the disease through Serbia, and disturbed economic conditions in Mexico disseminated the infection far and wide in that country. It is a disease which is spread by neglect of proper sanitary precautions and conditions favourable to vermin also favour the spread of typhus. In fact, it has been demonstrated that the disease may be transmitted from man to monkey and therefore presumably from man to man by means of the common body louse. While admitting that the body louse does convey the infection and that the head louse and bedbug may be regarded as suspicious conveyers, Hall thinks that it has not been conclusively proven that vermin are the only means of conveying the disease. The predisposing causes of typhus are famine, filth, overcrowding, and conditions favourable for the thriving of vermin.

The main means of prevention are to find and kill the lice and bugs, a difficult task indeed when dealing with a primitive and dirty people such as the Mexican peons, the class of individuals among whom Hall gained his experience.

With regard to treatment it was found that immunizing vaccine, so far available, had not been of any material service. Hall controls the fever with baths, the delirium with bromides and an ice-cap, and gives egg albumen in water, even though it has to be placed in the stomach through a tube passed through the nose. He gives large broken doses of calomel, followed by mag-



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nesium sulphate and high enemata which are left in as long as possible. If the urine is scanty, these enemata are of physiological salt solution. He begins the strychnine as a matter of routine, to combat the muscular weakness which is certain to follow. An ice-cap is kept on the patient's head and he is bathed not oftener than four times within the twenty-four hours. When the crisis is approaching Hall gives hypodermic injections of camphor in oil, alternated with spartein sulphate, to tide over the period.

The only specific complication noticed by this observer is that of gangrene of the leg, most commonly the left, below the seat of election for amputation just below the knee. It is a dry gangrene, extremely painful and slow to show the line of demarcation. In 95 per cent of such cases it is best to amputate, as soon as the line of demarcation is indicated. Hall remarks that in 25 per cent of the educated, high-strung civilized American patients he has treated for this disease he has observed a form of toxic insanity complicating the final outcome of the cases. This is due, no doubt, to the continued high fever and severe toxic poisoning. This insanity is not transitory, that is to say, that while within a few weeks the reasoning power returns to nearly normal, there remains a mild delusional insanity for a considerable period.

The Medical Journal states:—

Naturally the occurrence of typhus fever on a large scale in some of the countries engaged in war has aroused much interest in the cause and prevention of this disease. Most physicians are familiar with the measures used for preventing typhus infection by destruction of the body louse. At this time attention is directed to observations bearing directly on the primary cause of typhus fever. Some time ago Plotz described a bacillus, *B. typhi-exanthematici*, which he cultivated from the blood of a patient with the mild form of typhus—Brill's disease—occurring in New York, and also from the blood of immigrants with typical epidemic typhus. Now the bacteriologic study of the blood has been extended to the disease as it occurs in the Balkans and Russia, as well as in Mexico, blood cultures on typhus patients in these countries in a large percentage of cases revealing the presence of *B. typhi-exanthematici*. In Mexico, Olitsky, Denzer and Husk obtained the bacillus in most of the cases studied, the bacilli being most numerous in the early stages of the attack and in the most severe forms of the disease. They found the blood of the typhus patients whom they studied to be infectious for guinea pigs, and recovered the bacillus from the spleen of guinea-pigs infected with typhus blood or by means of lice from typhus patients. They also assert that they have obtained the bacillus from lice from typhus patients; but when so isolated the bacillus is gram-negative, becoming, however, gram-positive on subculture. Baehr and Plotz, who made the investigations in the Balkans and Russia, obtained cultures of the bacillus from the blood in nineteen of forty patients in Serbia and Bulgaria, while in Russia and Galicia, where the conditions were more favourable, the cultures were positive in nineteen of twenty-four cases. They were able to show that the bacillus is present in the blood during the entire course of the fever from the first day on, and that the more severe the disease the more marked the bacteremia. In two cases in which cultures were made during the initial chill, the blood contained enormous numbers of bacilli; in one case ninety-one colonies developed to each cubic centimetre of blood inoculated.

The results obtained so far from blood cultures show, then, that the bacillus described by Plotz appears to be present in the blood in the febrile period of typhus fever as it occurs in the United States (Brill's disease and epidemic typhus), Mexico, Serbia, Bulgaria, Austria and Russia, and certainly the intimate association of this bacillus with typhus fever would seem to be estab-



lished clearly enough. It is a matter of regret, however, that, owing to the prevailing conditions in the countries in which the disease now is epidemic, it has not been possible to carry on still more extended investigations on this important bacillus, more particularly in the line of prophylactic inoculations, which, so far as the results at hand appear to indicate, may be of great value. The agglutinin for *B. typhi-exanthematici* first appear at about the time of the crisis and describe a typical immunity curve.

An exceedingly interesting development in the typhus work is the demonstration of Prowazek, Rocha-Lima, and Toepfer and Schüssler that lice which have bitten typhus patients in the febrile stages of the attack contain large numbers of peculiar minute bodies, especially in the epithelial cells of the digestive tract. In Giemsa preparations these bodies are reddish, short, elliptic and coccus-like, sometimes with polar staining. It may be recalled that Ricketts and Wilder also described rods with polar bodies in lice infected with typhus fever, and Rocha-Lima has given these bodies the designation *Rickettsia prowazeki*. So far these bodies have been found only in lice which have been picked up from typhus fever patients or from their clothes or from other sources, and placed on typhus fever patients and allowed to bite them. Early in the attack there are only a few infected lice found on the typhus patient under natural conditions, but as the attack progresses the number increases and in the early stages of convalescence most of the lice found are said to contain the bodies. Experiments appear to show practically the same conditions; that is to say, early in the disease the lice must be left in contact with the patient longer before the bodies develop to any extent; but toward the ninth day or so, only a short time, even a single bite suffices. When convalescence has set in it is impossible to secure the development of the bodies by letting lice bite the patients. As stated, the bodies are absent in lice obtained from healthy persons and from persons suffering with diseases other than typhus fever; hence the presence of such bodies in a number of lice obtained in suspected cases of typhus fever is said to be sufficient to make the diagnosis of typhus. Teofer and Schüssler state that abortive cases of typhus fever give rise to a rich development of *Rickettsia* in lice. Lice containing them are infectious for guinea pigs; that is to say, when guinea pigs are injected with suspensions of crushed bodies of such lice, they develop the febrile reaction which is regarded as characteristic of typhus infection in guinea pigs. Rocha-Lima was unable to obtain growths of the bodies in the mediums employed by Plotz to grow *B. typhi-exanthematici*, and he also found only a superficial similarity between the Plotz bacillus and *Rickettsia*, the bacillus being larger and gram-positive, whereas the bodies are gram-negative; but Baehr and Plotz appear to regard the bodies as identical with the bacillus, and Olitsky, Denzer and Husk report the successful isolation of the Plotz bacillus from typhus lice.

Nicolle is an investigator of typhus fever who holds that we are still ignorant of the actual cause of the disease. In his experimental work he employs what he calls typhus virus, by which is meant virulent emulsions of the spleen and other organs of typhus-infected guinea pigs. His most recent work deals with the production of an antityphus serum. The serum from typhus convalescents having been found to possess specific preventive properties, he assumed that the typhus virus serve as antigen. Accordingly, asses were injected intravenously with emulsions of leukocytes of infected guinea pigs, and then many times with emulsions of spleen. The serum was found to acquire antityphus properties, being preventive as well as curative in guinea pigs, and the Tunisian investigators even claim that the serum has given favourable results in human-typhus, the death rate in a series of serum-treated cases being much reduced as compared with the ordinary death rate. By means



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of suitable immunity tests, Nicolle shows that Algerian, Moroccan and Balkan typhus viruses appear to be identical. These apparently significant results are not of necessity inconsistent with the view that the bacillus described by Plotz is the cause of typhus, as this bacillus has been found in the blood and organs of guinea pigs infected with typhus and consequently may have been the actual agent of immunization. If that is the case, immunization with the bacillus itself should give the same or even better results. At all events, it is clear enough that still further work will be required to settle all the questions as to the causation of typhus, even though great progress has been made.

Soldiers of the Turkish army in Syria are dying from typhus at the rate of 1,000 a day, according to a despatch from the country forwarded through Port Said and given out by the American committee for Armenian and Syrian relief. In addition to the famine from which the people of Syria are long reported to have been suffering, epidemics of both typhus fever and cholera are sweeping over that country, the despatch says.

Outbreaks of typhus fever in Germany have occasioned fresh attempts to be made to discover the micro-organism of this disease. Bofinger has figured appearances in the red blood corpuscles, which bear a very close resemblance to Seidelin's "bodies" in yellow fever; in view of the findings in the third report of the Yellow Fever Commission (West Africa) these objects may safely be excluded as bearing any causal relation to the diseases under consideration. Goldenstein, when investigating an epidemic due to Macedonian prisoners of war at Sofia, obtained a motile bacillus in pure culture from the blood of thirteen out of twenty-four patients during life. Unlike the organism of Plotz, it grows under aerobic conditions. It is a very short diplo-bacillus, and on agar forms small dry scale-like colonies of yellowish colour. On sub-culture a more definitely bacillary form is assumed, and the colonies become softer in consistency; it reacts negatively to Gram's stain. Gelatine is not liquefied. The serum of patients with fully developed typhus fever agglutinated this organism by the hanging drop method in dilutions varying from 1 in 50 up to 1 in 1,600 in one case. Injection of cultures into guinea-pigs caused only the unsatisfactory phenomenon of fever, which lasted for five to ten days and then disappeared. The author himself preserves an open mind as to whether he has found the true causal agent.

Though the transmission of typhus by lice is generally accepted as proved, yet the disease has been acquired under conditions in which there was no intimate contact with patients and the mode of passage of the sluggish louse from the infected to the healthy individual appeared inapplicable. Schilling, finding that Turkish officers entertained the belief that lice could be borne through the air for a considerable distance, tested this belief by an experiment which consisted of standing in a moderate wind a short distance to leeward of infested men who had stripped. Small lice, measuring about one-twelfth of an inch, appeared on the outer surface of the clothing of the observers, and it was concluded that they had been detached and carried along by the wind. The adult louse is usually anchored to the under surface of the shirt, but young lice are more active and would therefore be the more readily detached. The observation, if confirmed, may help to clear up some difficulties in explaining the spread of typhus fever in certain circumstances.

*Yellow Fever.*—The British Medical Journal speaking of the Yellow Fever Commission appointed by the Colonial Office, says:—

A series of reports on questions connected with the investigation of non-malarial fevers in West Africa, instituted by the Yellow Fever Commission recently appointed by the Colonial Office, have been published as supplements of the Yellow Fever Bureau *Bulletin*. They form two bulky volumes, of which the first has 7 plates, 9 plans and maps, and 128 charts, the total number of



pages being 352. Volume II has 12 plates, 1 map, 107 charts, and contains 400 pages. It is thus evident that an enormous mass of material has been collected, and Sir James Kingston Fowler in his preface states that "whilst accepting no responsibility for the views expressed in these reports, the Commission are of opinion that the results of these researches, conducted, as many have been, in the face of very great difficulties, should be placed on record, not only to commemorate the painstaking efforts of the investigators concerned, but also because they may prove useful as a basis for criticism and discussion, and may thus assist in the solution of the problems which still confront those whose administrative duties bring them into contact with yellow fever."

The recent history of yellow fever in West Africa is interesting. The late Sir Rubert Boyce, it will be remembered, some years ago propounded the theory that yellow fever was universally endemic all over the West Coast of Africa. If he had said that it prevailed endemically in certain areas, probably no one would have seriously disagreed with him, but the assertion of its universality was severely criticised. In many ways, however, these present reports are a result of Boyce's views. They bring out the fact—a fact, however, not seriously disputed before—that epidemics of yellow fever do from time to time occur in West Africa, the origin of which cannot be traced to importation from other parts of the world. The disease can, then, be spoken of as being endemic in West Africa, or at least in parts of it.

Yet another point brought out is the difficulty of diagnosing yellow fever, not only clinically, but even in some instances pathologically after death. The parasite of yellow fever is still unknown; there is therefore no single definite test by which it can be established that any individual case is or is not one of yellow fever. Mild atypical cases are notoriously difficult of diagnosis, and as those who thus suffer do not die, it is not possible to be absolutely certain the attack was one of yellow fever. This is a point in connection with which much work remains to be done. It is, of course, right to state that Seidelin, one of the commissioners' investigators, claims that he has discovered the parasite of yellow fever, and the open-minded attitude the commission takes is shown by the fact that papers for and against that view appear side by side in the second volume of these reports. The destructive criticism of Seidelin's views contained in a recent paper by Wenyon and Low finds support in papers by David Thompson and Lieutenant-Colonel Harvey, and it seems probable that the suggestion that the paraplasm is the parasite of yellow fever will not survive. In that case much of the matter in Volume II will have no permanent value, as, for instance, the chapters on experimental yellow fever in laboratory animals, reports on the transmission of *Paraplasma flavigenum*, and the report on some histological lesions observed in laboratory animals infected with yellow fever. Apart from these criticisms, many of the other reports are very valuable, and show evidence of careful and painstaking work. Lieutenant-Colonel Statham's conclusions on page 386 should be carefully noted by future investigators of the disease in West Africa. The pendulum has swung to the other side, and, as he states, fever with transient albuminuria is now considered highly suspicious of yellow fever. Albuminuria, however, is common not only in some of the types of malaria, but also equally in many other conditions, so that too much stress must not be laid on the symptom. Dr. Wyler's and Dr. Leonard's reports give a good idea of the yellow fever cases observed in Lagos during 1913 and the beginning of 1914. No one who has seen yellow fever in the West Indies and South America can read these reports without being convinced of the correctness of the diagnosis. Some of the cases which showed malarial parasites in the blood—notably, for example, Case 26, p. 270—might be questioned, but about the majority there is not the slightest doubt. The only point



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lacking in the reports of the cases is the absence of careful blood counts per cubic millimetre and differentially. It is a pity that so good a chance was lost.

The volumes as a whole, then, form a valuable contribution to our knowledge of yellow fever, and they will no doubt give rise to criticism and discussion. One word of warning to those who administer the West Coast colonies—*Stegomyia fasciata*, the carrier of yellow fever, seems to be as prevalent as ever in many parts of the coast. Now is the time to act against it. To wait until another epidemic appears will be too late. To be forewarned is to be forearmed; remove the intermediary and there will be no further trouble with the disease it carries. The examples of Cuba, Panama, Colon, and Rio point the way.

*Enteric Fever.*—The Department of Militia and Defence have just announced that for the twelve months ending December 31, 1916, only 167 cases of typhoid fever were reported as having occurred amongst the many thousands of men of the Canadian Expeditionary Force in Canada, notwithstanding the fact that typhoid fever is endemic in all parts of Canada, and is a disease especially affecting young adults from 17 to 30 years of age. This comparative freedom on the part of the Canadian Expeditionary Force is seen to be most striking when it is recalled that during the Boer war one man out of every nine in the British forces in South Africa was invalided through this disease, and that in the Spanish-American war, of 107,000 men in the camps at Tampa, Florida, and elsewhere, who had not left the shores of the United States, 20,000 contracted the disease. The remarkable change can only be attributed to inoculation. The Provincial Board of Health for Ontario has supplied to date all the typhoid and paratyphoid vaccine used by the entire Canadian Expeditionary Force (about 450,000 men). In all, nearly 600,000 doses have been supplied free of cost.

At the German Congress of International Medicine, which has been in session at Warsaw, Surgeon-General Huenermann reported that in the worst typhoid month (December, 1914), since the war began the number of typhoid cases in the German army was only one-fourteenth as many as in the worst month of the Franco-Prussian War, when the total number of German troops in the field was far smaller than now. The use of the Pfeiffer-Kolle anti-typhoid vaccine, which is now in general use, has, he said, been given in millions of instances without any serious consequences, and it was due to this vaccine that such a wonderful reduction of typhoid fever cases has been brought about.

To quote an extract from the London *Times*' report of the speech in the House of Commons on March 1 of Mr. H. W. Forster, financial secretary to the War Office:—

Nothing in the war was more striking than the triumph of science over disease. One of the most remarkable phenomena was the almost total disappearance of enteric fever, the dread scourge which in former wars had decimated our armies even more effectually than the efforts of the enemy. That was the more surprising when one considered the vast numbers of men, their density on the ground, and the poisoned condition of the soil, especially in France.

The last weekly returns of the number in hospitals suffering from typhoid fever were: France, four cases; Saloniki, nine; Egypt, three; Mesopotamia, eight; total, 24. The fever among British troops in France up to November 1 last year was 1,684; para typhoid 2,534 and indefinite cases 353, a total of 4,571. In the South African war nearly 60,000 cases were admitted to hospital, and there were 8,227 deaths. Thus several times as many died from this disease in South Africa as there were cases in France up to November 1 last.

The admission ratio of typhoid fever among the troops in France who had not been protected by inoculation was fifteen times higher than amongst those who had been inoculated and the death ratio was seventy times higher.



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*Leprosu.*—There are at present in your lazaretto at Tracadie, N.B., thirteen leper patients, six males and seven females. This is the smallest number for many years past. There were two deaths during the year. There were not any admissions. Ten are of French-Canadian origin, one of Icelandic, one of Russian, and one of Assyrian.

The Medical Superintendent, Dr. Langis, reports in part as follows: It is now six months since we resumed the treatment by means of intramuscular injections of chaulmoogra oil, combined with camphor and resorcin. We inject 5 c.c of this compound once a week. The good results obtained at the San Lazaro Leper Hospital, Manila, and elsewhere, by administering the oil with the hypodermic syringe, these last three or four years, decided five of our patients to submit to the objectionable pain caused by the needle. It is sore, especially the young ones find it so, but the good derived from it more than compensates the suffering, which generally does not last long. There have been no inflammatory processes following these injections.

The inmates taking advantage of this treatment from the very first experienced some relief, and if they continue a few months longer we hope to find them greatly improved.

To this date, with two female patients, thirteen and nineteen years old, the youngest has improved the most. The few nodules on her face are disappearing; also the characteristic macules and infiltrated patches on her body. The other is an advanced case, but with her so far the improvement is remarkable.

With the other women, one a tubercular, the other a mixed type of leprosy, the disease is not progressing. Results obtained so far are encouraging.

The fifth case, a male, suffered with keratites, but the opacity on the cornea is slowly disappearing.

The evidence in favour of chaulmoogra oil so administered is well demonstrated in our small colony by comparing almost similar cases of the disease who obstinately refuse the injections. They are complaining and getting worse every day. the disease with them is fast progressing.

The medical superintendent of the Lazaretto writes: "I wish to express my deep appreciation of the good sisters for their unfailing assistance and co-operation. The sublime service rendered by them to our unfortunate lepers especially during the last and most trying stage of the disease, cannot be given in words to do them justice."

To this I desire to add my tribute of praise and appreciation. Nothing could be nobler than the self-effacing devotion exhibited in their attendance on the lepers, evidently from the highest possible sense of religious duty.

In the United States in 1915, special blanks sent to the health departments of states and to cities having a population of over 10,000 at the time of the 1910 census asking for information regarding the known occurrence of leprosy in their respective jurisdictions during the calendar year 1915. The following table gives the information furnished in the blanks returned. It is probable that there were a few known cases in cities from which no reports were received. Undoubtedly there were also a number of cases which were not reported because their existence was unknown to the health departments.



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## REPORTS of Leprosy, by States, for 1915.

State.	Reported during 1915.	Died or removed, 1915.	Present Dec. 31, 1915.	Isolated under State control.	Isolated under local control.	Not isolated.
District of Columbia.....			1		1	
Hawaii.....	70		670	670		
Leper settlement, Molokai .....			614	614		
Kalihi Hospital, Honolulu.....			56	56		
Louisiana : Lepers Home of Louisiana.....			102	102		
Massachusetts. ....	2		12	12		
Penikese Hospital.....			12	12		
Michigan.....			( <sup>1</sup> )			
Bay City.....			1			
Big Rapids.....			1			
Three Rivers. ....			1			
Minnesota.....	1		10	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )
Albert Lea.....			1			
Cokato.....			1			
Elbow Lake .....			1			
Brown County— Linden Township.....			1			
Maple Bay.....			1			
Minneapolis .....			2			
Montevideo.....			1			
Freeborn County— Moscow Township .....			1			
St. Paul.....			1			
Oregon .....	1	( <sup>3</sup> ) 1				
Philippine Islands.....	841		4,472	3,972	250	250
Culion .....			3,680	3,680		
San Lazaro.....			292	292		
Various Provinces.....			( <sup>4</sup> ) 500		250	250
Porto Rico.....	3		37	37		
Leprosy colony.....			37	37		
Tennessee : Slayden .....	1	1				
Washington.....			( <sup>5</sup> )			

<sup>1</sup> The health officer estimates at least 15 cases in Michigan.<sup>2</sup> The health officer states: "In one sense, none; in another sense, all, because we advise how these cases shall be handled. All cases, however, are practically isolated at home or in some institution. One case is isolated on a county poor farm."<sup>3</sup> Patient died October 7, 1915.<sup>4</sup> Estimated.<sup>5</sup> Some cases at Diamond Head, not under State control.



A French historian in connection with the introduction of the alleged cure for tuberculosis by Dr. Friedmann a few years ago, calls attention to the little-known fact that the medicinal use of the sea turtle is by no means of recent date.

On July 8, 1483, King Louis XI of France sent George the Greek, master mariner, to the Cape Verde islands to seek "various things touching nearly to the well-being and health of our person." The Cape Verde islanders had the reputation of possessing a cure of leprosy, a report of which had been brought back to France by a traveller from the coast of Guinea at about the time King Louis was in declining health. According to the recital of this traveller, the big sea turtles were caught by the islanders when they came out on the beach at low tide to feed. They were at once killed and their blood caught in large tubs. Persons afflicted with leprosy bathed in the blood and afterwards ate of the turtles' flesh. This treatment was kept up for two years, at the end of which time the patients were usually completely cured of the dreadful disease.

This record would tend to show that Louis XI was a leper. That such was the case had been rumoured by chroniclers, but the reason of the expedition to the Cape Verde islands, now published for the first time, throws much light on the psychology of Louis XI, his ill-humour and his sedulous avoidance of mankind during the last days of his life. The wretched man evidently believed himself smitten with leprosy. He was, however, never fated to test the efficacy of the sea turtle remedy for he died August 30, 1483, before the return of the expedition.

In the *British Medical Journal*, October 21 last, Sir Leonard Rogers, Professor of Pathology, Calcutta, inserts a preliminary note on the intravenous injection of gynocardate of soda in leprosy. He writes as follows:—

In a recent paper I recorded a long experience of gynocardates by the mouth, and six months' use of solutions injected subcutaneously in the treatment of leprosy, and stated that this line of treatment had given greater improvement in my hands than any other. I find from my correspondence that as early as July, 1912, I inquired from a leading firm of manufacturing chemists if they could supply me with a soluble form of gynocardic acid or magnesium gynocardate suitable for hypodermic injection, but received a reply in the negative. In my recent paper I regarded gynocardic acid and chaulmoogric acid as synonymous on the strength of the following statement in the last (1915) edition of Martindale and Westcott's *Extra Pharmacopoeia*: "Chaulmoogra oil contains a quantity of palmitic acid, with three other fatty acids; of these the so-called gynocardic acid (chaulmoogric acid) is supposed to be the active ingredient."

Dr. Pyman has kindly informed me that this view is erroneous, as the work of Moss, and subsequently of Power and Gornall, showed that, on fractionizing the total fatty acids of chaulmoogra oil, those with the higher melting points, including palmitic and chaulmoogric acids, the sodium salts of which are very sparingly soluble in water, first separate, while Moss gave the name of gynocardic acid to the residual acids with low melting point of about 29° C., the sodium salts of which are freely soluble in water. According to Power and Gornall, Moss's gynocardic acid is not an individual substance, but is composed of a number of fatty acids with different melting points.

What I have used, then, for hypodermic injection in leprosy are the soluble soaps of lower melting point, fatty acids of chaulmoogra oil, which, following Moss, are rightly designated gynocardic acid, and which give the characteristic reddish-brown colour changing to olive green, with strong sulphuric acid. By further fractionization, several acids with different melting points can be separated, which may conveniently be called fractions B, C, etc. During the present year I have been isolating and investigating these with the help of Dr. Sudhamoy Ghose, D.Sc.Edin., working in the laboratory of Professor Rai Chuni



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Lal Bose Bahadur, and aided by a grant from the Indian Medical Research Fund, obtained through the kindness of Sir Pardey Lukis, Director-General Indian Medical Service, to each of whom I desire to express my thanks.

I have now discovered that the sodium salts of the lower melting point fatty acids can be safely given intravenously in animals in relatively very large doses, and I have already used them intravenously in some twenty well-marked leprosy cases during the last six weeks, with results which clearly show the intravenous route to present important advantages over the subcutaneous one. I therefore propose in the present paper to place on record briefly my methods so as to allow others to test them in this distressing and widely prevalent disease. I should mention that M. Vahram has recently recorded cases of leprosy treated by subcutaneous and intravenous injections of a suspension of a dried and pulverized mixture of chaulmoogra oil and gum arabic, the dose of the oil having been only from  $\frac{1}{400}$  to  $\frac{1}{50}$  of a grain; yet two cases were reported as improved after some thirty injections. I find the sodium gynocardate I have been using is two hundred times less toxic for rabbits than his insoluble dried chaulmoogra oil, while my preparations have the immense advantages of being freely soluble in water, being, indeed, just the form of substance in which fats are normally absorbed from the digestive canal through the blood vessels, so the soluble gynocardates appear to possess manifest advantages over Vahram's insoluble suspension of dried chaulmoogra oil, which was fatal to rabbits in the small doses of 0.0004 gram per kilo.

These substances may be prepared either from the cold-drawn chaulmoogra oil, or, as I pointed out in my former paper, from the buttery substance obtained by further compression of the seed of *Taraktogenos kurzii* (products of which alone are dealt with in this paper, although hydrocarpus oils are also being investigated, but the soluble sodium soaps of which have been found to be more irritating when injected subcutaneously than those of *Taraktogenos kurzii*) with the aid of heat obtained by steam circulating around the compression chamber. Hitherto this product has been regarded as a waste product, although I have found it to contain a large proportion of the active substances of the oil. Briefly, the method of preparation is to saponify the oil or butter with caustic potash and absolute alcohol, the soaps thus obtained being converted into fatty acids by means of sulphuric acid. These fatty acids are dissolved in hot alcohol and separated into fractions with varying melting points by gradual cooling and removal of the acids, which solidify at differing degrees. The fractions thus obtained may be further purified by dissolving in ether and recovering again by evaporating off the solvent, by which means they are rendered somewhat less irritating when the sodium salts are injected subcutaneously, for which purpose they must be neutralized accurately with the aid of phenol-phthalein. When about two-thirds of the fatty acids have thus been separated the residual third, which is liquid at room temperature in Calcutta (about 28° C.), is obtained by distilling off the alcohol, and may be previously termed gynocardic acid C. Of the first separated two-thirds those with the higher melting points of from 43° to 40.8° C. form sodium soaps which are insoluble, or only slightly soluble in water, and may be termed fraction A. They include palmitic and chaulmoogric acids, and are unsuited for either hypodermic or intravenous use, while it is very doubtful if they are of any value internally. They constitute about half of the total fatty acids. The remaining acids of this two-thirds have melting points from 37° to 40° C. and form sodium soaps which are freely soluble in water and may be termed gynocardic acid B. A still larger number of fractions may be separated out if desired, as we have recently done. The best product for clinical use which we have yet obtained was got by extracting finely divided and dried *Taraktogenos*



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seeds with ether and subsequent fractionization as above. The sodium soaps of fractions B and C mixed together caused very little local irritation when injected subcutaneously, while the observations on intravenous injections recorded later in this paper are mainly based on the use of this product, which clearly contains all the lower melting point acids of both the cold compressed oil and the butter obtained by further compression of the seeds with heat. It will be referred to as fractions B and C of the whole seed.

First, with regard to the further progress of the three cases described in my first paper. Case 1 has not been seen again, but I have received reports that the satisfactory condition recorded previously is maintained. Case 2 wrote to me several months after his return to Europe that a leading British authority had declared him to be free from all active signs of the disease, so he may be regarded as apparently cured, although a longer period must elapse before it will be evident if the recovery will be permanent. Case 3 is still under observation, although she has only been able to attend very irregularly for the injections. After a month's absence she returned with slight recrudescence of the macular patches, but improved again with further treatment, but is still not clear of the disease, having given the method no fair trial.

I have now just completed a year's experience of the subcutaneous method, but owing to my cases having been, with one exception, entirely out-patients or very advanced cases in a leper asylum, and to the earlier preparations in particular having given rise to considerable local pain and induration, only one patient has been under observation for the full period of a year, and eight more have been under regular treatment for six months and over. Five of the cases were of the anaesthetic type and four tubercular. The former includes the patient who has been under observation for a full year, and at the end of eight months all the light patches had disappeared and sensation had returned to them, which was complete except in the largest patch, where there is still slight loss of response to a light touch. An ulcer early healed, and he has regained power in one foot which previously showed foot-drop. During the last four months he has only received occasional injections, so as to keep him under observation, and he continues free from symptoms and appears to be practically cured. Two other cases in which the hands were affected have nearly regained the lost anaesthesia and some power, and continue to improve steadily. The fourth case showed typical claw hands, with great loss of sensation and power, and also foot-drop, as well as anaesthetic patches on the face and neck. After six months' treatment he has regained nearly all the lost sensation, except in one hand, where it is partially restored, and much of the power, being able to shave himself with a razor, and his case is most promising. The fifth anaesthetic patient improved so much that after eight months he considered himself cured and went to his country against advice. He returned after four months with some return of anaesthesia and is improving again under the intravenous treatment. The results, then, in the anaesthetic cases may be regarded as very promising.

Of the four tubercular cases one advanced case in a boy has been under treatment for ten months, during which greatly thickened and nodular ears have become smooth, and his face is now normal. Very few broken down bacilli could be found at the last microscopical examination, and he appears to be nearly free from the disease, the improvement having been most remarkable. The second case showed a number of tubercles on the chin and nose, up to half an inch in diameter, being the most advanced case I have ever seen. Here again the improvement after eight months has been great, although numerous bacilli can still be found, and progress is slow. It has been more rapid since intravenous injections have been given. Two other cases with well



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marked facial affection have also greatly improved after seven and eight months' treatment respectively, but are still not well. In addition, an earlier case with affection of the face, and hard nodes on the arms containing numerous bacilli at first, after treatment for four months has lost nearly all his lesions, and no leprosy bacilli could be found in the remains of a node recently examined, so in this case the outlook is very hopeful. On the whole the tubercular cases have responded rather more slowly to the treatment than the anaesthetic ones, while I have noticed that there is greater local pain and induration at the sites of the injections in the former class. It is not improbable that intramuscular injections of sodium gynocardate would be more rapidly absorbed and more effective than subcutaneous ones, but I have not yet tested this point. Dr. Victor G. Heiser obtained his very favourable results in leprosy by intramuscular injections of chaulmoogra oil combined with camphorated oil and resorcin.

In the case of pigeons the minimal lethal dose of a 2 or 3 per cent solution of fractions B and C was 0.045 gram per kilo. Of fraction B it was 0.04 and of fraction C 0.06 per kilo., so the sodium soaps of the lower melting point acids are less toxic for pigeons than the lighter melting point ones; 4 and 5 per cent solutions are more toxic for pigeons than 2 and 3 per cent ones containing the same amount of the drug. In the case of rabbits, 0.1 gram per kilo. in a 3 per cent solution proved fatal, but 0.075 produced no effect, although it is equivalent to 78 grains in a man of 80 kilos., showing the very slight toxicity of the drug even intravenously. Lieutenant-Colonel W. D. Sutherland, I.M.S., Imperial Serologist, has very kindly tested the haemolytic action of sodium gynocardate, and he informs me that it produces a slight and interesting type of haemolysis, but one which is negligible from the practical point of view. When death takes place in pigeons it occurs within one to four minutes with convulsions. If this period is survived vomiting often occurs, but is followed by recovery. When over 1 grain had been given without any harm in rabbits of 1.500 grams, equivalent to over 50 grains in a man of 70 kilos., I felt justified in trying the drug intravenously in leprosy cases, beginning with one-tenth of a grain, and increasing by one-tenth at each successive dose, using a 2 per cent solution, and have already given up to four-fifths of a grain with no immediate effect, or any sign of toxic influence, apart from the local reactions and fever to be described later, and rarely some headache.

A 2 or 3 per cent solution may be made in distilled water (or normal saline), and after sterilization in an autoclave  $\frac{1}{2}$  per cent carbolic acid is added. For intravenous use the solution should be quite clear, and if any precipitate forms it should be filtered and resterilized. The veins in the forearm are distended by stretching a stout piece of rubber tubing around the upper arm, one end being put through a loop under the other, so that it can be rapidly loosened by pulling out the loop. If the veins are very small the air bag of a sphygmomanometer may be used and pumped as tight as necessary to fully distend the veins. The selected vein is punctured through the skin of the forearm or hand with a fine sharp needle, and, if there is any doubt about the vessel having been entered, a drop of blood may be drawn up in the syringe, and the whole quickly injected before clotting can take place. The pressure hand may now be released, the needle withdrawn, and collodion applied on cotton wool. Little or no irritation results if some of 2 per cent solution escapes into the tissues around the vein, so the same vessel may be used repeatedly.

The two great advantages of the intravenous over the subcutaneous method are its painlessness and greater efficiency. As nearly all my cases are Indian out-patients, over whom there is no control, some of them ceased to attend long before any material result could be expected from the subcutaneous injec-



tion on account of the pain and induration at the seat of injection. Since the intravenous route has been used no such disappointments have been experienced. Of much greater importance is the more rapid improvement which has been observed to follow the intravenous injections, which is already clearly evident. Several months are required to produce any decided improvement by the subcutaneous method, while, especially in tubercular cases, the progress is apt to be disappointingly slow even after it has started. It is far too early to say what will be the ultimate results of the intravenous medication, but my present experience is decidedly encouraging.

The most striking result is the occurrence of definite local reactions in the diseased tissues, sometimes accompanied by fever, which has been seen in several cases after from two-fifths to three-fifths of a grain of sodium gynocardate intravenously, of a degree that I have not seen occur after subcutaneous injections, although Dr. Heiser has recorded some local reaction after intramuscular injections of chaulmoogra oil, and I have seen more rapid improvement of lesions in whose neighbourhood the subcutaneous injections of gynocardates have been made. The most decided reaction was in the greatly thickened ears of a tubercular case, in whom fever occurred for three days with redness and swelling of the helix, accompanied by some serious discharge containing broken down leprosy bacilli. After the subsidence of the reaction at the end of ten days the diseased tissues were decidedly softer and less indurated than before, while nodules on the face, not showing the local reaction, were also diminished in size. In another case with very large tubercles on the face, a similar but less acute reaction was also followed by distinct improvement. In two anaesthetic cases, with greatly thickened ulnar nerves, tenderness and slight swelling appeared in the affected portions after intravenous injections, which has been followed by some return of sensation in previous anaesthetic areas of the hand. One of these patients also had fever, but had been previously subject to it. It is thus clear that intravenous injections of the drug have produced selective local reactions in the diseased tissues, which have been most evident in those patients with the greatest amount of infiltration of the tissues with leprosy bacilli, so they are most interesting and suggestive. It is too early to say whether the drug should be pushed to the extent of producing such reactions, but I am inclined at present to think they are decidedly beneficial when moderate in degree, while I have as yet seen no ill effect to follow them, although the possibility of dissemination of the bacilli in the body must not be lost sight of.

*Conclusions.*—I have now given about two hundred intravenous injections of gynocardate, and my experience has led me to substitute it almost entirely for the subcutaneous method. Further experience is required to ascertain how far it is advisable to push the doses, but there can be little room for doubt that even half a grain intravenously is likely to have a greater effect than four grains slowly absorbed from a subcutaneous injection. My present impression is that the intravenous method is likely to prove as great an advance on the subcutaneous one as the latter has in my hands on the oral administration of gynocardates or chaulmoogra oil. I desire, however, once more to clearly state that I make no claim to be able to cure leprosy, although I now have hopes that in time even this may eventually result from continued researches on the lines indicated in this and my previous paper on gynocardates, which are largely an extension of Dr. Heiser's important work on the treatment of leprosy by injections of chaulmoogra oil.

In conclusion, I may point out that the reactions produced by gynocardates in leprous tissues, and the apparent destruction of Hansen's bacillus, raises the very important question as to whether some such similar reaction may not be obtained in the case of another human acid-fast bacillus—namely, that of



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tubercular diseases. Fortunately, this hypothesis can be tested by animal experiment, and I have already commenced a research on the subject.

*Beri-Beri.*—The Medical Journal of January 27, 1917, has the following:—

It is in a high degree interesting to observe that the importance which diet plays in the production, prevention, and treatment of disease is now generally recognized. This recognition is due, to some extent, to increased and more definite knowledge as to the diet necessary for nutrition and growth. It used to be thought that such diet should consist solely of proteins, carbohydrates, fats, salts, and water. This view, however, has been revised by the discovery by Funk and others that a diet, to fulfil all the conditions requisite for normal nutrition and growth, must contain also vitamins. Our knowledge of these vitamins is yet very far from complete, but enough has been ascertained by experimental research and by clinical experience to state that when these substances are lacking nutrition suffers; and that, following a diet from which the vitamins have been removed, disease supervenes. Diseases of this nature have been denominated deficiency diseases, of which one of the most typical is beri-beri.

The deficiency theory of beri-beri is strongly borne out by a careful consideration of all the circumstances. Experimentally, it has been demonstrated that by feeding fowls on polished rice a polynēuritis is brought about, a condition is produced, indeed, pathologically indistinguishable from beri-beri. Furthermore, when rice polishings are added to the rice, the birds rapidly return to the normal. It was in this manner that Funk showed that there was present in the aleurone layer of the rice grain an organic substance the absence of which caused beri-beri.

But the proofs that beri-beri is a deficiency disease are eminently conclusive from the clinical standpoint. As Marshall Findlay points out in the *Practitioner* for January, 1917, the experiments of Frazer and Stanton in Java are almost classical. In these experiments four hundred and ninety-three Japanese coolies were employed; of these, 220 were fed on white rice, the remainder on the non-polished variety, with the result that among the former class twenty cases of beri-beri developed, while among the latter there were no cases. Instance can be piled upon instance in which the continued consumption of rice deprived of its pericarp and the greater part of its aleurone layer has been followed by beri-beri; and per contra, when the deficiency has been supplied, the disease has speedily been cured.

It is probable, in fact more than likely; that there are other predisposing causes, of which the most important, according to Findlay, are the temperature and relative humidity of the atmosphere. In the Philippines, beri-beri is much more common among men than women, although the diet of both sexes is practically the same. The men, however, are largely employed in mines, in which the air is hot and moist.

In the *Lancet* of March 11, 1916, Wilcox contributed an especially able paper on beri-beri, in the course of which he dealt exhaustively with the treatment of the disease, and pointed out that the vitamin for preventing beri-beri or polyneuritis in animals is different from that which prevents scurvy. He further drew attention to the fact that yeast is a substance which is perhaps the richest in anti-beri-beri vitamin, and that egg-yolk, brain, liver, kidney, sweetbread, oatmeal, haricot beans, and peas, are all fairly rich in vitamin. In the treatment of beri-beri, first of all, when available, yeast should be given. Three or four raw eggs should be given daily. Pea soup is a valuable article of diet in the treatment of this condition, and naturally all foodstuffs which contain the largest amount of anti-beri-beri vitamin are indicated. Moreover, a valuable addition to such dietary will be fresh lemon juice.



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Vitamines is the new word that is attracting so much attention in the medical world at the present time. It signifies certain qualities in food materials which are essential to normal vitality in animals and human beings, though their presence has been up to this time scarcely suspected and though they exist in quite small quantities. Whenever they are entirely absent from the diet of a particular individual he will eventually suffer from a severe painful condition of nerves and certain mutilating developments in the skin.

For instance, when rice is polished before being eaten certain materials are removed which are necessary to health, and if rice is a large factor in the diet beri-beri results. The same conditions with regard to corn lead to pellagra. Highly milled wheat is lacking in vitamins, but usually the people who eat white bread supply their vitamins from other sources. They must be healthy. Sterilized milk is always lacking in vitamins, and pasteurized milk very probably also, the heat destroying these substances.

Apparently the vitamins, as the name would imply, represent certain vital qualities in foodstuffs which may be rather easily destroyed or removed. Because of their presence a great many important foods are more healthful if taken in the natural state.

Dr. Casimir Funk, of New York, claiming to be the author of the term "vitamin," writes to the *Journal* as follows:—

The following statements I wish to make in justification of my position as the author of the term "vitamin" as well as in refutation of some of the statements printed in your editorial entitled "What is a Vitamin?" (*The Journal*, May 6, 1916, p. 1470). I have no doubt that the sense of justice and fairness which have always impressed me in your publication will guide you to publish my letter in an early issue of *The Journal*.

When early in 1911 I started the research which led to the isolation of the vitamin-fraction from various foodstuffs, my work was inspired by the remarkable results of Eijkman, Grijus and Schaumann, who were able to prove that in rice-polishings and in yeast, substances are present which protect fowls, pigeons and men against beri-beri. My task was then to find out to which chemical group these protective substances belong, and this has been successfully accomplished and described in two publications (*Lancet*, London, November 4, 1911; *Jour. Physiol.*, December 22, 1911). From reasons unknown to me, references to these two early publications are usually omitted in the literature, and the paper of Hopkins (*Jour. Physiol.*, 1912, xliv, 425) is quoted, which has been undoubtedly partially influenced by my work. It was only in 1912 (*Jour. State Med.*, June, 1912) after a careful revision of my experimental data that I introduced the term "vitamin" for these protective substances which are indispensable for life and which, judging from their chemical reactions, belong undoubtedly to the group of organic nitrogenous bases. Later on I went farther, and a few substances were isolated and analyzed which, I have reasons to believe, are chemically related to the original vitamin present in less purified fractions. I am glad to say that even now, after five years, there is not a single paper in the existing literature able to refute my experimental data. That the introduction of the term "vitamin" was justified we can judge from the quick succession of terms used to designate the same substances: torulin of Moore, oryzanin of Susuki, antiberi-berin of Tsuzuki, accessory substances of Hopkins, and finally substances A and B of McCollum. If terms could only be applied to chemically pure, fully identified substances, 90 per cent of the already existing names in the physiologic chemistry would have been discontinued (example: names of ferments, hormones, proteins, nucleins, polysaccharids, lipoids, cerebrosids, etc.).



As to the necessity of two different substances (one soluble in alcohol and the other in water) for growth of young animals, the work done in conjunction with A. B. Macallum was not able to substantiate it. Vitamin is soluble in alcohol and more so in water, but we are dealing here with one and the same substance. Our present results so far show that the beri-beri-vitamin suffices for growth of young rats; for long maintenance (over sixty days) a small supply of antiscorbutic vitamin seems necessary; otherwise scurvy with even slight rachitic symptoms occurs in rats. This condition can be avoided by using autolyzed (wet) yeast or orange juice, in difference to dried yeast, which apparently possesses no anti-scorbutic properties for rats. So far in our experiments butter was found to have no action on the growth of rats, but was found to have slight antiscorbutic effect (scurvy-vitamin carried down from milk). In order to avoid further complications and fallacies in the already complicated problem of growth in rats, we wish to test our preliminary results in all directions before final publication; but we find that some of the recent results on the growth of rats, on which your editorial is based, give not the slightest justification for the discontinuation of the term "vitamin."

In the same issue of *The Journal*, Dr. E. J. Wood deals with pellagra as being due to a deficiency of vitamin. Apparently by mistake my name was omitted as the originator of this hypothesis (*Jour. State Med.*, June, 1912; "Die Vitamine," Wiesbaden, 1914). Later on I pointed out (*Jour. Physiol.*, December, 1913; *Michen. med Wchnschr.*, 1914, No. 13) that the acute form of pellagra prevailing in the United States might be due to the use of extensively milled corn, to which conclusion Dr. Wood also arrives.

E. B. Vedder, Washington, D.C., ends an article on the relation of diet to beri-beri with the following conclusions: "As there are many conditions under which it is difficult for certain people and institutions to produce a rich and varied diet, I should like to repeat and emphasize the simple dietary rules which I have elsewhere formulated for the prevention of deficiency diseases: 1. In an institution where bread is the staple article of diet, it should be made from whole wheat flour. 2. When rice is used in any quantity, the brown undermilled, or so-called hygienic rice, should be furnished. 3. Beans, peas or other legumes, known to prevent beri-beri should be served at least once a week. Canned beans or peas should not be used. 4. Some fresh vegetables or fruit should be issued at least once a week and preferably at least twice a week. 5. Barley, a known preventive of beri-beri, should be used in all soups. 6. If cornmeal is the staple of diet it should be yellow meal or water-ground meal, that is, made from the whole grain. 7. While potatoes and fresh meat, known preventives of beri-beri and scurvy, should be served at least once a week, and preferably once daily. 8. The too exclusive use of canned goods must be carefully avoided. I am sure that the strict application of these rules will eradicate scurvy and beri-beri, and believe that they would be equally efficacious in eradicating pellagra.

*Dengue.* Since the original work of Graham in 1903, of Bancroft in 1905, and of Ashburn and Craig in 1907, *Culex fatigans* has generally been supposed to be the real carrier of dengue. It is true that Bancroft had apparently two successful cases of infection with *Stegomyia fasciata*, the subjects being bitten by such insects twelve and ten days after they had bitten dengue patients. Clelland, Bradley, and McDonald have recently followed up the insect carrier in an epidemic of dengue which was raging in Queensland, and had extended to some of the north coast towns of New South Wales. In a critical analysis of the previous work they point out that Graham admits that in many, perhaps in all, of his experiments *Stegomyia fasciata* was present amongst his mosquitos, and that therefore all he proved was that mosquitos can carry the disease, the variety, or varieties remaining in doubt. They further criticise Ashburn and Craig's account of transmission by *Culex fatigans*. "The successful



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case," they say, "was probably one of dengue, but arguing on analogy with yellow fever, the very short mosquito 'ripening' period (less than two days) would make one accept it with reserve as originating from the mosquitos. One cannot certainly exclude the possibility of there being other sources of infection. Failing other evidence, the case is undoubtedly very suggestive of the possibility of *Culex* being a vector of dengue, but we can hardly understand the importance attributed to this isolated case by most textbooks." The three observers made two series of mosquito experiments. In the first, four persons were bitten by *Stegomyia* and two by *Culex*. The results were negative. There was, however, a large mortality in the mosquitos collected, and, except one individual who received ten bites, the bitings were unsatisfactory; these results are not further referred to in the paper. In the second series of experiments a collection of about 100 *Stegomyia fasciata* and 112 *Culex fatigans* was made from the district in which dengue fever had occurred; in some cases the insects were taken from the actual bedrooms where patients were lying sick with the disease. This heterogeneous collection was then given the chance of feeding upon a dengue patient, and many of both types bit freely. They were then taken to Sydney, a town free from dengue cases, and there produced the disease in four out of seven persons on whom biting experiments were made. That the disease produced was really dengue was proved by the fact that blood taken from three of the cases reproduced the disease when injected into other persons. Two cases were heavily and repeatedly bitten by *Culex fatigans* with no result. These experiments prove that *Stegomyia fasciata* can spread the disease, but whether *Culex fatigans* also may not do so is not quite clear from the context of the paper. It is, at any rate, not absolutely disproved. The failure of *Culex fatigans* to produce the disease in the two cases mentioned may have been due to non-infection of the insects or to some insusceptibility of those bitten. More experiments are required to prove this point. It would be well to rear the mosquitos from larvae and then let them bite infected cases; this would also afford useful information as to the length of the cycle of development in the mosquito, the incubation period in man, and other interesting points. The observations, however, as they stand are very interesting and suggestive, though they do not finally settle the point as to whether one genus of mosquito or more is implicated in the spread of dengue.

*Anthrax*.—A fatal case of anthrax was reported March 8, 1917, as occurring at Longwood, in the vicinity of Huddersfield, England, in an employee in a woollen mill at that place. The patient was a man who had been working at a shaking machine at which dust was shaken from the wool and carried by a fan into another room. The wool originated mostly in the East Indies. The type of the disease in the case reported was internal or pulmonary anthrax. A second case occurred on the 15th instant.

*Acute Anterior Poliomyelitis*. (Infantile Paralysis.) D. James J. Walsh points out that this is not a new disease. If any one, he says, will go to the Philadelphia Museum he will find there the skeleton of a little prince of one of the early dynasties of Egypt who lived more than 4,000 years ago and who was crippled by infantile paralysis.

The form of crippling by this disease is so typical that Dr. John K. Mitchell, the son of Dr. S. Weir Mitchell, of Philadelphia, did not hesitate to make the diagnosis even after this length of time. Besides there are a number of pictures of the sixteenth and seventeenth centuries which present victims of infantile paralysis. Some of Murillo's pictures of the objects of charity down the centuries painted as decorations for the Hospital at Seville in Spain present some of them. Spanish painters were very realistic in their studies of such subjects, and so it is not hard to recognize the actual diseases present.

Indeed, the hardest thing in the world I know of, after years spent at the history of medicine, would be to find a new disease that we were sure was new. Tuberculosis has been traced back for more than 4,000 years; hints of cancer are to be found for as



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long as the memory of man runneth. Bubonic plague has been definitely traced 1,000 or more years before Christ.

The name for appendicitis is only twenty-five years old, but the disease has been traced far beyond and is as old as mankind's present stage of anatomy. Hookworm disease is familiar only for ten or fifteen years, but Dr. Sandwirth, of Cairo, finds traces of it in Egypt more than 3,000 years ago. The examination of the arteries of mummies shows "hardening of the arteries," that latest disease to attract attention, in existence 2,000 years before Christ. Infantile paralysis in ancient Egypt then would be no surprise. Since 1905, infantile paralysis has appeared more or less frequently throughout North America, from the Atlantic to the Pacific and from Alaska to the Gulf of Mexico. As a rule the disease has occurred in isolated form; but, occasionally, there have been severe and alarming epidemics. There have been cases of anterior poliomyelitis—as infantile paralysis is scientifically known—in every state in the Union and in every large city each year for a number of years past. Epidemics have occurred in New York in 1907, in Minnesota and Nebraska in 1908-1909, in Iowa in 1910, in Ohio and Kentucky in 1911, in New York State in 1912. The disease appeared in epidemic form in the city of New York during the early part of last summer (1916).

Since the early summer of 1916 there have been 24,000 cases of infantile paralysis in the United States. Eighteen thousand of these were in New York City and the adjacent territory, in the States of New York, New Jersey, Pennsylvania, Connecticut and Massachusetts, the Borough of Brooklyn being the first to become infected.

In the Montreal district, from October 16 to 25, there have been twelve cases of infantile paralysis in Westmount, and only one since the last-mentioned date. In Verdun, there have been only two cases before the 24th of October. In Montreal West, they had two cases on the 25th of October. In Lachine, there was only one case on the 26th. In Ville Saint-Pierre, they have had three cases previous to the 24th of October. In Outremont, there has not been a single case reported. And in Montreal where there had been eighty-five cases from January until the 26th of October, we have had since this last date three cases on the 27th, two cases on the 28th, two cases on the 30th, two cases on the 31st, one case on November 2, one case on the 3rd, two cases on the 4th and not a single one on the 29th of October, the 1st, 5th, 6th, 7th, 8th and 9th of November.

Infantile paralysis is an acute, infectious disease, usually attacking children, ushered in, as a rule, with the symptoms common to other acute infections and resulting in partial paralysis which comes early in its course. It is caused by the invasion of the brain and spinal cord by a minute germ or organism.

The disease is not as infectious as scarlet fever or diphtheria. In most communities only a very small percentage of exposed persons acquire it. This percentage varies, however, and is usually higher in rural districts than in larger cities. Under certain conditions, which we do not clearly understand, the disease becomes very infectious and epidemics result.

The apparent difference in infectiousness in city and country has been explained by these facts: (1) Only a small percentage of people are susceptible to infantile paralysis. (2) When the disease appears in a community, those persons who are exposed and not immune, acquire the disease and, if they survive the attack, are doubtless immune to a later attack. (3) Infantile paralysis is present more or less constantly in large cities so that exposure of susceptible persons is much more likely than in smaller centres of population. It is this lesser likelihood of exposure of the susceptible person in the smaller and more isolated community which is said to be responsible for the greater percentage of infections and also for the larger number of adults affected in rural epidemics.



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Age is an important factor in the disease. As a rule it attacks those under 5 years of age. It is stated that children under 5 constitute but 10 per cent of the total population; but that they furnish 50 to 90 per cent of the cases of infantile paralysis.

In some epidemics, children from 5 to 15 years of age seem as susceptible as those younger.

Not over 10 per cent of cases are among adults.

Practically all epidemics of infantile paralysis and most isolated cases occur during the summer season—between the months of May and November—and there is said to be some connection between the disease and hot, dry weather. On this account, the disease is thought by some authorities on the subject to be spread by dust.

It is interesting to note that the epidemics at Buffalo and Cincinnati occurred during wet weather.

As a rule the disease in the United States has been largely confined to the Northern and North Central states and the chief epidemics have occurred in these sections. Virginia, Mississippi and some other southern states have not entirely escaped outbreaks.

The disease is transmitted, in all probability, by the secretions of the patient, dried or otherwise, coming in contact with the nasal passages or throat of the susceptible person. Experimentally the disease has been transmitted through the digestive tract, but it is not likely that this occurs often.

The fact that the virus so tenaciously resists drying makes it reasonable to assume that the disease is carried in infected dust.

At the present time, it seems that the chief means of transmission are kissing, sneezing and coughing, the two latter throwing the virus into the air whence it is directly carried to the noses and throats of others. Many cases are transmitted by mothers, who, after caring for the noses and throats of children who may be carriers of infection, carry the virus to other children.

Lower animals, birds and fowls very probably suffer from this infection; but it is not likely that man acquires infection in very many instances from these animals. However, poultry, pigs, dogs and cats are still somewhat under suspicion.

In certain cases it has been practically proven that flies carry infection; but this is not the common means of transmission. At one time it was believed that the disease could be transmitted by biting insects carrying the virus in the blood taken from the patient. This is not proven nor have the germs been shown to be present in the blood.

Incidentally, the character of living conditions seem to have little to do with the development of the disease. It develops in clean homes as well as in those which are filthy; and attacks the healthy child as well as it does the weakling.

In recent epidemics it has been possible to prove contact with the sick in only about 25 per cent of cases. This is doubtless due to the large number of undiagnosed cases and the healthy virus carriers.

*With regard to prevention.*—according to Dr. Simon Flexner, "Protection to the public can be best secured through the discovery and isolation of those ill of the disease, and the sanitary control of those persons who have associated with the sick and whose business calls them away from home. Both these conditions can be secured without too great interference with the comforts and the rights of individuals."

The essential facts upon which our preventive measures rest are:—

(1) Infantile paralysis is contagious.

(2) The convalescent patient may carry the organisms of the disease for weeks or months.

(3) Healthy persons, exposed to infection, may carry organisms in their throats and nasal passages for a long period of time.

(4) The infectious material comes largely from the nose and throat; but it is also found in the intestinal passages and may be present in the urine and sweat.

(5) Children are particularly susceptible; but adults are not necessarily immune.



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(6) Infection probably takes place through the mucous membranes of the nose and throat.

(7) The exact means of transmission is uncertain. The disease has been attributed to dust infection, to fly-borne infection, to food infection and to direct contact. It is impossible at this time to say which, if any, of these theories is correct.

In view of this uncertainty, preventive measures to be effective must be very general in character.

All persons suffering from the disease must be rigidly quarantined for a period of at least five weeks.

There should also be quarantine or rigid observation of all persons who have been in contact with patients suffering from the disease.

There should be careful destruction of all discharges from infected persons and of all things contaminated with such discharges. After the death, removal or recovery of the patient, the premises should be thoroughly disinfected.

The virus of infantile paralysis is destroyed by bright sunlight. Hence the quarters occupied by the patient and the rest of the house should permit free access of sunlight at all times. Disinfection of rooms and contents should be followed by thorough sunning.

The public should be warned that convalescent patients may carry the virus of the disease for considerable and uncertain periods after complete recovery.

At the annual meeting of the American Public Health Association held in Cincinnati, Ohio, October 24-27 last, it was moved by Dr. E. P. Lachapelle of Montreal, seconded by Dr. Frederick Montizambert, of Ottawa:—

That in view of the fact that infantile paralysis has existed for several months and still exists in the United States and Canada, taking on in some localities an epidemic character; that considerable anxiety is expressed by the public generally, and that the public, the physicians and the health authorities may well expect an authoritative statement upon the subject from this association in annual convention;

Be it resolved, that the President be forthwith authorized to appoint a small committee of specialists and of those who have had experience of the disease, with instructions to meet immediately and to prepare a report of the present actual knowledge of the cause of the disease, the manner and agents by which it is spread, the best methods of treatment, and the best preventive measures;

And that this committee submit its report before the close of this annual meeting; and that such report be given to the public immediately.

The resolution committee of the association unanimously approved of the above resolution, and, in accordance with it, the president, John F. Anderson, appointed the following special committee: Dr. Haven Emerson, Commissioner of Health, New York City; Dr. Wade Frost, United States Public Health Service, Cincinnati, O.; Dr. A. J. Chesley, Epidemiologist, Minnesota State Board of Health.

*Committee Report.*—The specific cause of poliomyelitis is a micro-organism, a so-called virus, which may be positively identified at present only by its production of poliomyelitis in monkeys experimentally inoculated. Such experiments have shown this virus to be present not only in the nervous tissues and certain other organs of persons who have died of poliomyelitis, but also in the nose, mouth and bowel discharges of patients suffering from the disease. It has been proved by similar experiments that healthy associates of poliomyelitis cases may harbour the virus in their noses and throats.

These experiments, together with the fact that monkeys have been infected by direct application of the virus to the mucous membrane of the nose and by feeding of



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the virus, are strong evidence that in nature infection may be directly spread from person to person.

Observations on the occurrence of the disease might seem at first thought to be inconsistent with this conception, since contact between recognized cases can seldom be traced. However, this may be adequately explained by the lack of means for detecting mild non-paralytic cases and by the belief that healthy carriers of the virus and undetected cases are considerably more numerous than frankly paralyzed cases.

Many facts, such as the seasonal incidence and rural prevalence of the disease have seemed to indicate that some insect or animal host, as yet unrecognized, may be a necessary factor in the spread of poliomyelitis, but specific evidence to this effect is lacking, and the weight of present opinion inclines to the view that poliomyelitis is exclusively a human disease and is spread by personal contact, whatever other causes may be found to contribute to its spread. In personal contact we mean to include all the usual opportunities, direct or indirect, immediate or intermediate, for the transference of body discharges from person to person, having in mind as a possibility that the infection may occur through contaminated food.

The incubation period has not been definitely established in human beings. The information at hand indicates that it is less than two weeks, and probably in the great majority of cases between three and eight days.

If the foregoing conception of the disease is correct, it is obvious that effective preventive measures, approaching complete control, are impracticable, because isolation of recognized cases of the disease and restraint upon their immediate associates must fail to prevent the spread of infection by unrecognized cases and carriers. These difficulties would appear to be inherent in the nature of the disease. Nevertheless, we may hope for the development of more thorough knowledge which will permit of more effective control of the disease than is now practicable. Of first importance is the more general recognition by practitioners of non-paralytic cases through clinical observation and laboratory procedures. Lumbar puncture has been shown to offer valuable aid in diagnosis, and a more general use of this test is to be encouraged, since it not only facilitates accurate and early diagnosis, but in many cases affords symptomatic relief as a therapeutic procedure. Without undertaking to predict the future progress of research, we may hope for certain possible developments which may afford far more effective control of the disease, with substantial relief from many inconveniences at present inevitable. Among these possibilities we would include a practical test for the detection of all clinical types and carriers, a simple and reliable test for distinguishing between susceptible and insusceptible persons, and means of conferring artificial immunity against poliomyelitis.

At present our information demands the employment of the following administrative procedures in attempting to control the disease:—

1. The requirement that all recognized and suspected cases be promptly reported.
2. Isolation of patients in screened premises. The duration of infectivity being unknown, the period of isolation must necessarily be arbitrary. Six weeks has been recommended by the Conference of State and Territorial Health Officers with the Surgeon General of the Public Health Service as sufficient, and this period has been generally accepted throughout the United States.
3. Disinfection of all body discharges.
4. Restriction of the movements of intimate associates of the patient as far as practicable. This should include at least exclusion of the children of the family from schools and other gatherings.
5. Protection of the children as far as possible from contact with other children or with the general public during epidemics.
6. Observation of contacts for two weeks after the last exposure.

There is no specific treatment of established value in poliomyelitis. During the persistence of the acute symptoms of the disease the important principles of treatment



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are rest in bed, symptomatic relief, and passive support for the prevention of deformities. Active measures during this stage are not only useless but are apt to cause serious and often permanent injury. Hospitalization of patients where possible should be encouraged. The best chances of recovery from residual paralysis demand skilful after-care, often long continued, and always under the direction of a physician familiar with the neurological and orthopedic principles of treatment. The provision of such after-care often becomes a community problem, demanding the co-operation of all available agencies, social and professional.

In view of the large number of cases of this disease in the neighbouring states instructions were issued by you requiring every person under sixteen years old desiring to enter over the land frontier, coming from any one of the affected group of states to produce a certificate properly signed stating that the bearer had not the disease, nor had been in contact with any one who had. And the certificate had to be issued not longer than 24 hours before departure. Through the kindness of the Immigration and Customs Services their officers examined and checked these certificates.

This inspection was put on in August and taken off at midnight of 30th November. As far as the United States Public Health Service was concerned the epidemic in New York was officially declared to be at an end on the 5th October.

The inspection of children in interstate traffic was discontinued and the quarantine lifted. Government physicians who had been on duty in that city were directed to report to their regular stations in various parts of the country.

In Philadelphia, quarantine was raised on October 1; and in Baltimore on November 1.

Opening the new Yorkville Forum, at the Lyceum, Eighty-sixth street and Third avenue, Dr. Haven Emerson, Health Commissioner, expressed his belief that there will be no epidemic of infantile paralysis next summer. At the same time he made it clear to the two hundred persons present that common rules for health must be obeyed strictly as a precaution against the disease. He also explained how infantile paralysis could be prevented from spreading.

"Last summer," said Dr. Emerson, "there were 2,400 deaths from infantile paralysis, but we do not expect an epidemic of the disease this summer. The fear of the disease last summer led people to be more careful about their health and continued precautions in this direction will be very helpful as a means of preventing infantile paralysis.

Keep the sick from the well. There are many mothers and fathers who fail to call a physician when their children get sick and allow them to remain ill without professional medical aid for a week or more. By that time the disease is in an advanced stage. Had the parents called in a physician at the beginning a different story might be told.

Since last December there have been reported on an average each month until now two or three cases of infantile paralysis. But the disease is more prevalent in the summer, and we expected to have more cases during that time. There is no reason to believe, however, that there will be an epidemic of infantile paralysis next summer.

The New York Herald of 3rd December last has the following as a special despatch:—

In the laboratories of the famous Mayo Brothers' clinic at Rochester, Minn., a micro-organism has been discovered which is believed by investigators in pathology to be the causative agent of infantile paralysis, which last summer killed or crippled, it is said, nearly twenty thousand American babies.

Dr. E. C. Rosenow, who is in charge of the experiments, will not yet assert positively that the germ which he and his associates, Dr. E. B. Towne, of Boston, and Dr. G. W. Wheeler, of New York, have succeeded in isolating, is the germ



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of infantile paralysis, but in what he terms a "preliminary note," presented to the State Medical Society, it is shown that innumerable experiments during the last few months all point in the same direction.

If it be true that the agent of the disease has thus been found—and there is no real doubt in the minds of the scientists acquainted with the experiments that this has been done—then half of one of the greatest battles in modern medical science already has been won. There remains the important task of developing a serum or vaccine, or perhaps both, with which immunity may be established in human beings. Before another summer the world may hear that infantile paralysis has been definitely relegated to the category of such diseases as diphtheria and small-pox and other readily controlled diseases. With the memory of last summer's horror still fresh in the public mind, the full importance of the discovery cannot be overlooked.

Because of the high hopes which the discovery of some mistake or broken link in the present chain of scientific evidence would dash, those interested in the experiments at Rochester are especially chary of making announcements. Nevertheless, Dr. Rosenow's guarded report cannot but have the effect of creating intense public interest in the outcome of experimentation with curative vaccines and serums. It is known that a quantity of both already has been prepared and is being employed upon animals at the Mayo laboratories.

In the "preliminary note," Drs. Rosenow, Towne and Wheeler give the results of their study of the epidemic which was worst last summer in New York. Dr. Rosenow passed more than a month in the thick of the fight waged against the disease by the New York health authorities and the experiments outlined were based upon more than fifty acute cases of the disease both in New York and Rochester.

Inoculation of rabbits, dogs and monkeys with the germ taken from human beings has been followed in every case by the onset of what is called characteristic poliomyelitis, or infantile paralysis. The symptoms produced in the animals are in every respect the same as those witnessed in human beings. Cultures made from dogs and rabbits dead of the disease, when injected into other dogs and rabbits have produced instant and fatal attacks of infantile paralysis.

It is no secret that since the isolation of the germ of infantile paralysis many experiments have been made at Rochester looking to the perfection of a vaccine or serum for its prevention. It should be added, however, that the cure, even if found, would not restore the use of their crippled limbs to children who have been victims of the disease.

*More iniquities of the Rat.*—The *British Medical Journal* of February 17 last adds another indictment against the rat and its fleas as the carriers of the infective agent in Weil's disease. And Dr. Mark Richardson, formerly Secretary of the Massachusetts State Board of Health has added still another to the list of their enormities by advancing the theory that the rat and its fleas may be responsible for the spread of infantile paralysis.

The *British Medical Journal* says:—

Every man's hand is against the rat. In political circles the rat's character is held to explain the moral turpitude that leads from time to time to defections from the party. Women, it is credibly reported, will fly from the rat with all the alacrity they display in escaping from the dangerous proximity of the domestic mouse. Indeed, one would probably be well within the truth in stating that the rat's only real friend among human beings is the schoolboy, who is apt to cherish white specimens of the race as pets. From the epidemiological point of view rats have had a thoroughly bad name of late years, if only as the presumed involuntary carriers of fleas infected with the bacillus of bubonic



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plague, a disease that kills its tens of thousands every year. Rats, too, are the carriers of infection in the rare disease known by the name of "rat-bite fever," of which over eighty cases have been described in Europe, Asia, and America, during the last twenty years. It is of interest to note, while this fever is under discussion, that certain Japanese investigators have quite recently reported that, after investigating two cases of the disease, they have identified a new spirochaete, which they name the *S. morsus muris*, as the cause of rat-bite fever in Japan. This organism is found in about 3 per cent of Japanese house rats, and, a matter of importance from the point of view of treatment, it is most markedly affected by salvarsan. It is true that other scientists have found quite other organisms (aspergilli, telosporidia, diplococci, bacilli) to be the cause of rat-bite fever, and in the *British Medical Journal* of February 19, 1916 (p. 285), will be found an account of Dr. F. G. Blake's confirmation of Schottmüller's discovery that the causal organism of the fever is a streptothrix. But it is pointed out that rat bites may be quite capable of infecting human beings with other diseases as well as with true "rat-bite fever," and that the cases recorded by Schottmüller and Blake differed in several important particulars from rat-bite fever as it occurs in Japan. From the experimental point of view, rat-bite fever may be transmitted from rats to guinea-pigs, as was proved by Ogata in 1911. This experimental rat-bite fever has been investigated by three bacteriologists at Tokyo, and they claim to have proved that the disease is due to a spirochaete that under the microscope differs in form from that described by the four Japanese investigators mentioned above, but resembles it in being sensitive to the action of arsenical compounds. About ten rats out of some forty employed with success in these experiments were found to be carriers of the spirochaete of rat-bite fever.

But this does not complete the tale of the rat's nosological infamy. There is now good reason for believing that rats may also be the carriers of the infecting agent in Weil's disease. As may be seen by reference to any medical textbook, some thirty years ago Weil described an epidemic form of infectious jaundice that has since been known by his name, and is now also known as spirochaetosis icterohaemorrhagica. A variety of jaundice that is similar, if not identical, occurs in Japan; and, as was related in the *British Medical Journal* of April 1, 1916 (p. 491) certain Japanese medical men identified in 1915 a new spirochaete, the *S. icterohaemorrhagiae*, as the organism giving rise to this variety of epidemic jaundice. The identical organism has been isolated from cases of infectious jaundice in France, in Italy, and in the lands of the Central Powers. An account of the occurrence of the same disease in the army in Flanders, written by Captain Adrian Stokes, R.A.M.C. (T.), and Captain J. A. Ryle, R.A.M.C. (S.R.), will be found in the *British Medical Journal* of September 23, 1916 (p. 413). The disease is clearly widespread at the present time, therefore. It is also highly infectious, and has even been caught in a bacteriological laboratory by a very careful worker engaged in transmitting the virus from one experimental animal—a guinea-pig—to another. The pathogenic spirochaetes are excreted in the urine and faeces of the patients, a fact which may indicate the common routes of infection in Weil's disease, and points out the paths along which general prophylaxis against its spread must be sought. But prophylaxis by both active and passive immunization is also possible. A recent paper on the subject by the Japanese doctors Ido, Hoki, Ito, and Wani, establishes the fact that guinea-pigs can be protected against infection by the specific spirochaete in two ways—either by inoculation with cultures of the organism, or by the injection of immune serum from other animals already protected in this manner. In the case of man, only passive immunization has yet



been attempted, by the use of serum derived from a horse protected against spirochaetosis icterohaemorrhagica through vaccination with preparations of the spirochaete. Although no case has occurred in which the efficacy of this immune serum could actually be put to the test, the authors are of opinion that it does confer on man a partial immunity to the disease; this is supposed to last for from six months to a year. They also give evidence to show that in Japan both the house rats and the brown ditch rats are often carriers of the spirochaete which may be found in their kidneys, as was pointed out in 1916 by Miyajima. The importance of this observation is indicated by the fact that cooks and butchers seem particularly prone to this form of acute infectious jaundice; indeed, two of the fifty-five patients treated by the authors had been bitten by rats from seven to nine days before they developed the disease. Probably the infection is transmitted from rats to man by means of the rat's urine, directly or indirectly, in most cases. Nearly 40 per cent of the rats in the city and coal mines of Kyushu were found to carry highly virulent pathogenic spirochaetes in their kidneys.

A full account of the serum treatment of Weil's disease, so far as it has been tried at present, has been published by Drs, Inada, Ido, Hoki, Ito, and Wani. At first the serum was obtained from goats immunized by inoculation with the spirochaete. This was in August, 1915; later the serum obtained from patients convalescent from the disease was employed, and later still the serum from actively immunized horses. The serum acts mainly by destroying the spirochaetes; technically speaking it is spirochaetolytic and spirochaetocidal, and that it has any antitoxic effect has not yet been demonstrated. It should be given subcutaneously or intravenously in large doses (up to 60 c.cm.) as early as possible in the disease. In all, thirty-five patients were treated, of whom five died of the disease, though one was moribund on admission to hospital. These figures show a mortality of about 11 per cent. As a rule, the mortality from Weil's disease in Japan appears to be from 30 to 50 per cent. Such results as these show that the serum treatment is at any rate promising; but the authors do not claim more for it at present, considering that the number of cases treated is not large enough to justify the drawing of any more definite conclusions. They find that the serum destroys the spirochaetes contained in the circulating blood, promotes the development of antibodies, and lessens the number of the organisms in the patients' viscera, where they are already numerous by the fifth day of the disease.

The following facts supporting the theory that infantile paralysis is transferred by rodents, insects, or both are offered by Richardson. (1) Summer incidence of the disease; (2) the resemblance of the disease in its epidemiology to malaria and yellow fever has been noted more than once; (3) the positive results of Rosenau and also of Anderson and Frost, together with the successful experience of Flexner with the bedbug. That the bedbug might be the intermediate link in the chain seemed to Richardson highly improbable in view of the fact that infantile paralysis attacks with almost equal frequency all strata of society. The possible relation of the rat to infantile paralysis was first brought to Richardson's attention in 1910 through an observation made by Dr. Charles E. Simpson, state inspector of health. In investigating an epidemic of the disease, Dr. Simpson observed the fact that many rats, whose homes had been in a town dump, were compelled, because of a fire in that dump, to seek refuge in the neighbouring houses. In these houses infantile paralysis seemed to be unduly prevalent. Another experience pointing in the same direction occurred in a small country neighbourhood occupied as a summer colony by a number of city residents. The only immediate unusual factor to



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be assigned for this epidemic was the removal, from one situation to another, of an old barn. The barn cellar was dug up and improved, and during this operation, the affected children played in the excavation. The inference is, of course, that many old rat holes were destroyed and that the accumulation of years in the way of rat disease and fleas may have been distributed broadcast to the outside world. A third observation, but a rare one, was made in a Massachusetts city where, in an infected district, many rats were said to have been found dead. In another city a muddy river and its tributaries honey-combed to a greater or less extent the municipality. The location of the cases of infantile paralysis seemed to have a remarkable relation to this stream and its branches. Indeed, the whole Massachusetts experience seems to indicate that the disease has been endemic along its rivers, most of which are polluted by sewage to a greater or less extent. The possible association of the water rat was thus indicated.

The great increase in poliomyelitis during the last twenty-five years has been explained as due to great increase in facility of transportation all over the world, so that infinitely increased human contact has become possible. The same argument would apply, however, to the transfer of infected rats from one locality to another. Indeed such transfer in freight cars and ships carrying grain, cattle, pigs, etc., must be common. The relation to the railroads of cases of infantile paralysis has been noticed by a number of observers.

Nothing could be more probable than that children living near railroads should play in rat infected freight cars. Infected rats furthermore, if dropped from freight cars, would necessarily seek their food in the immediate neighbourhood. In the transfer of the infection from the rat to man, the agency of the flea is assumed, although the possible contamination of food by rodent excretions might well be considered. The insect transfer might be simply mechanical or it might require a preliminary cycle of development of the virus in the flea. Furthermore, the possible role of cats, dogs and other animals, or even human beings, as carriers of infected fleas, would be apparent. Moreover, in grossly unsanitary surroundings, the fleas might carry infection from one child to another directly. These theories, Richardson says, explain better than any other hypothesis submitted the epidemiologic facts as observed in infantile paralysis.

Dr. Richardson states that Rosenau has recently produced paralytic phenomena in rats by inoculation of the virus of infantile paralysis. Extended experimental investigations will be necessary to determine the value which should be attached to his theory, but Dr. Richardson is, we think, correct in saying that it is not easy to make the theory that it is conveyed by human contact fit all the facts.

According to the Federal Public Health Service, it costs \$1.82 to board a healthy rat a year, says the *Minneapolis Journal*. That is at the rate of half a cent a day. The rat is voracious and not over-particular about his food, taking the same wherever he can find it. The total annual board bill of the rat tribe in the United States must therefore be some hundreds of millions of dollars.

In return for this liberal expenditure in his behalf Moncieur Rat does nothing whatever that is useful, and much that is positively harmful. His worst disservice is playing host to the fleas that spread the bubonic plague, but he spreads other disease germs as well. From an economic standpoint he is a wastrel, and from a health standpoint a plague-carrier.

It has been generally accepted that rat population of a country is about equal to the human in numbers. Taking the population of Canada at seven and a half millions at the above cited cost of the board of a rat, our total annual board bill of the rat tribe would amount to \$13,650,000.



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*Anti-rat Regulations.*—To limit or prevent the landing of infected rats from incoming vessels arriving from Liverpool after the discovery of plague-infected rats there certain precautions now enjoined by you at our Atlantic ports. These included.

The breasting out of the vessel from the pier for not less than six feet.

The placing on every hawser between the vessel and the pier of a funnel or disc of metal not less than three feet in diameter and not more than three feet from the vessel.

The reduction of the gangways to a minimum by day, and their guarding by quartermasters. At night all gangways to be withdrawn, or if one be essential, that it be lighted as well as guarded.

As soon as an incoming vessel has received her quarantine clearance she passes from your jurisdiction and comes under that of the Minister of Marine. The Marine Department kindly consented to have your views in this matter carried out, and they issued instructions to all their harbour-masters at all the Atlantic ports to have these regulations enforced.

*Cerebro-spinal meningitis.*—Having received information from the Militia Department that some soldiers returning to Canada via St. John, N.B., this month were supposed to have been in contact with cases of cerebro spinal meningitis before embarking at Liverpool, these men were detained at quarantine for bacteriological examination. These proved negative in all cases.

*International Frontier Inspection.*—No frontier quarantine inspection has been required this year, with the exception of the precautions against the introduction of infantile paralysis already described.

*Transfer of Baltimore Quarantine.*—In June last the *Medical Record* announced that this State controlled station was in course of being transferred to the United States Public Health Service. This completes the transfer of State quarantines to the United States Federal Government.

*Circulars.*—Circular letters were issued from time to time to your different officers, calling their attention to the various matters during the year connected with the appearances of epidemic diseases abroad.

*Buletins, etc., received.*—The weekly Public Health Reports of the United States Public Health Service have been regularly received and are of great value, as are also the monthly bulletin from provincial, state, and municipal boards of health in Canada, the United States, and other countries. The bulletins of the International Office of Public Health, Paris, and of the Sleeping Sickness Bureau, London, have been regularly received throughout the year, and in both cases spare copies have been distributed to the provincial boards of health.

*Official visits, inspections, etc.*—On the 23rd June I left, by your instructions to inspect on the Atlantic seaboard, inspected at Grosse Isle, Que., the leper lazaretto at Tracadie, N.B.; the quarantine stations at Chatham and St. John, N.B.; Digby, Halifax, Sydney and Louisburg, N.S.; and Charlottetown and Summerside, P.E.I.

On August 17, I left for the Pacific coast. I inspected at Vancouver, Victoria, William Head, and Prince Rupert, and the leper lazaretto at Darcy Island.

No annual meeting of the Canadian Medical Association was held this year, owing to the absence of so many medical men on military duty.

On September 12 and 13 I attended a Joint Congress of the Canadian Public Health Association, and the Canadian Association for the Prevention of Tuberculosis at Quebec, Que.

On October 24 and 27 I attended the annual meeting of the American Public Health Association, which includes the United States, Canada, Mexico and Cuba, at Cincinnati, Ohio.



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*Changes in Medical Staff.*—Halifax, N.S., D. J. V. Graham has replaced Dr. Blackett as substitute for Dr. V. W. Mackay, overseas. St. John, N.B., Dr. Hagerty again took winter duty for Dr. Warwick, overseas. William Head, B.C., no successor yet for Dr. Chester P. Brown. Prince Rupert, B.C., Dr. John Code substitutes for Dr. Tremayne, overseas.

*Stations, etc.*—*Grosse Isle, Que.*—Vessels inspected 355, being an increase of 10 over last year, and at the advanced inspection Station at Rimouski, Que., 28, being a decrease of 12 since last year. Persons inspected at Grosse Isle 32,281, at Rimouski 16,707. A total of 48,988, a decrease of 4,348 since last year, of 162,329 as compared with the season of 1913, and of 244,580 as compared with 1914.

Infectious disease occurred on 24 vessels. The admissions to hospital were 60. One death from diphtheria. In 1913 there were 947 admissions, and in 1914, 1,720. These figures are liable to be equalled or surpassed after the war.

By order of the Department dated August 3, 1916, all troop ships and Admiralty transports were exempted from quarantine inspection when in a healthy condition.

Owing to the decrease this year in the number of mail steamers coming up the St. Lawrence, you were satisfied from the 1st of July, with two inspecting officers instead of three. Drs. Lepage and Lord continued on duty for the season.

*Halifax, N.S.*—Vessels inspected 402, being 128 more than last year. Persons inspected 29,042, 18,347 less than last year.

The admissions to hospital were eleven.

*St. John, N.B.*—Vessels inspected 267, being 5 less than last year. Persons inspected 30,882, being an increase of 7,005 over last year. Admissions to hospital seven.

*Chatham, N.B.*—Vessels inspected 120. Persons inspected 1,149. No quarantinable disease.

*Digby, N.S.*—No vessels for quarantine inspection.

*Sydney, N.S.*—Vessels inspected 276, being 28 more than last year. Persons inspected 70,979, being within 54 of last years figure. Only two cases of sickness; one case of measles, one case enteric fever.

*Louisburg, N. S.*—Vessels inspected 78, as against 112 last year. Persons inspected 2,119, last year 2,985.

*Charlottetown, P.E.I.*—Vessels inspected 14. Persons inspected 114. No case of quarantinable disease was found on these vessels. The charge of two cases of measles in March off the Car Ferry belonging to the Marine Department was assumed as a help to that Department. As our quarantine hospital was not accessible at that time of year, they were treated at a private house. All expenses were assumed by this Department. In May a case of diphtheria in a member of the crew of the same Car Ferry was admitted to and treated in our quarantine hospital.

*Summerside, P.E.I.*—No vessels for quarantine inspection.

*William Head, B.C.*—Vessels inspected 230. Persons inspected 44,679. This shows an increase of 57 in vessels inspected, and of 17,899 in persons inspected as contrasted with last year. Smallpox was brought to the station by two steamships. Other minor diseases were amoebic dysentery varicella, and mumps.

Total admissions to hospital fifteen.

Owing to an outbreak of cholera in Japan from the beginning of October all storage passengers from the Orient were detained for the bacteriological examination of their secretæ. A total of 1,087 persons were so examined. No cholera carrier was found.



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On the 24th February last the threatening Nod so far passed that these examinations were from that date suspended. Similar action was taken at the same time by the public health authorities of the contiguous ports of the United States.

*Victoria, B.C.*—Vessels inspected six. Persons inspected 1,005. No quarantinable disease.

*Vancouver, B.C.*—No vessels inspected.

*Prince Rupert, B.C.*—No vessels inspected. A fresh water supply is urgently required. Also a disinfection building. There is, as yet, no provision made for handling an infected vessel at this port.

*Tracadie Leper Lazaretto.*—There are at present only thirteen patients. Six males and seven females. Only about half the number present a few years ago. Two deaths during the year. No admissions. Those of the patients who are being treated by intra-muscular injections of Chaulmoogra Oil combined with camphor and resorcin show continued signs of improvement.

The devotion and care given to the patients by the nursing religious sisters continue to be above all praise.

*Darcy Island Leper Lazaretto, B.C.*—Five lepers have been admitted during the year. One a Japanese has been deported. One a Russian after three months observation has been released under conditions of periodic examination as not being a menace to the public health. Two Chinese, and one, a Chilean-Kanaka, remain under treatment and care.

The sudden death occurred on April 19 last of A. E. Wilson, the orderly and caretaker at Darcy Island. He had been for years a faithful and valuable official, and his death is a loss to the service.

*Public Works Health Act.*—Mr. C. A. L. Fisher, your inspector for Eastern Canada states that the public works in his territory have been composed of railway, canal and mountain tunnel construction. He reports the year as having been exceptional in the non-appearance of infectious diseases amongst the men employed, with the exception of half a dozen cases of enteric fever (mostly mild) on the Welland Ship Canal works.

Mr. Fisher on his several tours of inspection found the medical service fully satisfactory, and the sleeping quarters and boarding of the men employed fully equal to the good conditions of previous years.

Dr. A. E. Clendenan your inspector for Western Canada points out that the volume of work has been very materially lessened with the duration of the war.

The Grand Trunk Pacific has ceased construction. The Canadian Pacific have no large undertakings since the completion of the Rogers Pass Tunnel. The Canadian Northern has only diminished numbers of employees on urgent lines. On the other hand the Edmonton, Dunvegan and British Columbia railway with its branch the Canada Central, The Hudson Bay railway, Esquimalt harbour on the Pacific ocean, and Nelson harbour on Hudson bay are all being pushed with the vigour of former years.

The medical service has been such that no complaints have been made by employees.

Not one epidemic of infectious disease has occurred during the year. Here and there individual cases cropped up but were so treated as to prevent their being a menace to others.

I have the honour to be, sir,

Your obedient servant,

F. MONTIZAMBERT, M.D.

*Director-General of Public Health.*



## MISCELLANEOUS.

## APPENDIX No. 2.

## EXHIBITIONS.

SAN DIEGO, CALIFORNIA, March 31 1917.

SIR,—I have the honour to submit the following report of the operation of the Exhibition Branch of your Department for the fiscal year ending March 31, 1917.

During the whole fiscal year of 1916-17, our exhibit has been one of the main features of the Panama-California International Exposition, held at San Diego, California. This exposition opened its doors to the public on the 18th February, 1916. Our participation was then quite ready, the Canadian Building having in fact been opened to the visitors three days before the official opening, viz., on the 16th of February.

Our display is installed in one of the finest buildings of the exposition which has been placed at our disposal by the management, free of charge. It occupies a most advantageous situation on the main thoroughfare of the exposition, so that no visitors to the grounds can fail it to see it.

The Canadian exhibit is composed of the natural products of the country. It includes the products of agriculture, horticulture and forestry, as well as important collections of minerals and of fish and game specimens. The water-powers of Canada are also shown in relief maps. The progress of colonization in our Country is fully illustrated by means of large panoramas and other pictures. Our transportation systems are well advertised, especially those affording facilities for the handling of the crops in the Canadian Northwest. Our display of fresh and bottled fruit is particularly effective, and our mineral exhibit is receiving the highest commendations from all.

During the whole period of the exposition the weather was fine and the influx of tourists at San Diego very important. Large numbers of people visited the exposition, and very few of them, if any, failed to see our exhibit.

One of the especially gratifying features of our participation was the visit of several high officials of the various United States transcontinental railroads, who were all very complimentary in their praise of our exhibit as a priceless advertisement for Canada and our three Canadian transcontinental railways.

Numerous inquiries about the wheat lands of the Canadian Northwest were received by the staff, and also by the representative of the Department of the Interior who had his quarters in the Canadian Building. The interest created regarding Canada in this part of the country by our exposition was very noticeable and has been demonstrated in a practical manner by the numerous bookings for the Canadian West that have been made continuously during the year.

The Panama-California International Exposition was scheduled to close its doors on the 31st of December, 1916; but in view of the fact that the attendance at the end of the month of December was still very satisfactory, and considering also that during the winter months the tourists are very numerous in San Diego as well as in the whole of southern California, the management of the exposition decided to prolong the exposition during three months, that is, until the end of March, 1917. The expectations of the committee in that respect were fully realized, as the success of the exposition continued unabated until the end of the three months' extension.

We received an extensive and very complimentary publicity from all the newspapers of this part of the country, and the management of the exposition have been



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very appreciative in their remarks regarding the value of our exhibit as a drawing card. And I am glad to state that, in fact, the Canadian exhibit has achieved here a great success, and of a kind that will entail the best practical and beneficial results for Canada.

The whole respectfully submitted.

WM. HUTCHISON,  
*Commissioner.*

The Honourable

The Minister of Agriculture of Canada,  
Ottawa, Ont., Canada.